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Competitive Bank Monies: Reconsidering Hayek and Klein from a Transactions Perspective[1]

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Abstract

In this paper the case made by Klein (1975) and Hayek (1976) for competitive bank monies is reconsidered. To do so we build a model of the demand for bank money that derives from money's ability to separate commodity purchases from sales across time and so avoid the trading costs implied by barter and the double coincidence of wants. Such a model allows us to view the bank cheating or time inconsistency problem alleged to undermine the case for free banking as part of a larger concern with the creation and maintenance of bank quality in a competitive banking environment. As such it helps to further refine the circumstances under which competition is and is not consistent with optimal money provision and stable money prices.

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Competitive Bank Monies: Reconsidering Hayek and Klein from a transactions perspective

In this paper the case made by Klein (1975) and Hayek (1976) for competitive bank monies is reconsidered. To do so I build a model of the demand for bank money that derives from money's ability to separate commodity purchases from sales across time and so avoid the trading costs implied by barter and the double coincidence of wants. Here differentiated monies are produced by profit maximizing firms (banks) who sell a valued financial intermediary instrument to households in order to consolidate purchasing power to finance intertemporal differences in household consumption profiles.[2] Banks then specialize in bringing together locational specific borrowers and lenders and profit by their ability to locate opportunities and enforce repayment at lower cost than can either private individuals or bank rivals.

I begin by following Klein and Hayek in assuming that individuals have perfect information either on the aggregate size of each bank's note issue (deposits) or the price level, and the rate of new note issuance or rate of price change.[3] This postpones dealing with the asymmetric-information bank cheating problem (sometimes called the time inconsistency problem) alleged to undermine the case for competitive banking.[4] It also allows focus on the characteristics of the steady state (instead of having to describe more fully the process of adjustment or the full dynamic model underlying the model's equilibrium). By allowing actual and expected prices to differ only at the end, we can better see how bank cheating is just an extreme version of the more general problem of determining and rewarding improvements in bank quality (already present under perfect price information).

I. The Individual and Market Demand for Bank Money

Rather than assume that individuals have an inherent demand for the monetary services that only bank money can provide, I begin with the recognition that the double coincidence required of barter exchange makes exchange more costly.[5] In our transaction cost model, then, individuals both hold and use money to economize on the individual-specific transaction costs of finding appropriate trading partners. While the use of money will not eliminate trading costs, the cost savings achieved by its use and the concomitant ability to advance specialization (by allowing the temporal separation of purchases from sale) motivates our demand for money.[6] To facilitate this transaction demand, each bank provides a distinctive money (note or deposit) together with potentially different types of bank services. This allows different bank monies to be cost minimizing in different contexts.[7] For individuals to willingly use different monies in making their day-to-day transactions, there must exist the ability to exchange monies at a sufficiently low cost to make multi-money banking viable. For individuals to hold more than one bank money, even more is required.

Given the information and other setup costs of accessing the money-exchange or bank clearing services required of a multi-money system, it is assumed uneconomic for each individual to hold more than one money and utilize more than one bank.

Because of the focus on trade and its costs, I abstract from production, i.e., the production of all goods except for the K distinct monies. Hence the ith individual is assumed to be endowed (à la Patinkin) with a flow of up to J nondurable consumption goods each period, x^e_j, and to have accumulated an optimal level of financial wealth, W_i. Some portion of that wealth will be held as bank money, M_{ik}, and the remaining portion in the form of a single illiquid asset, $p^B_k B_i$, that earns its own rate of return of i_{hh} each period.[8] Hence denominated in terms of the kth bank's money, $p_k W_i = M_{ik} + p^B_k B_i$.[9] Finally, the individual's costs of trade are incorporated through a transaction cost function, t_i, where

$$t_i = t[v_i, M_{ik}/p_k, ß_k, ß], \tag{1}$$

and where $v_i = \Sigma(p_{jk}/p_k)[(x_{ij} - x^e_{ij})^2]^{1/2}$. The first argument in (1) is a measure of the volume of trade undertaken by the ith individual, v_i. The cost of trade is assumed to increase at an increasing rate in its real volume so that representing the partial derivative with subscripts, both t_v and $t_{vv} > 0$.[10] The second argument reflects the savings permitted by the use of money. Using a financial instrument that is generally accepted in exchange secures final consumption goods at lower cost than can finding reciprocal trading partners directly and acquiring the desired commodity bundle under barter.[11] The cost savings achieved are assumed sufficient to motivate the holding of one of the bank monies. Larger real money holdings permit larger discrepancies in timing between the arrival of receipts and the need to make payment and so reduce the cost of subordinating the timing of consumption to the dictates of trade.[12] In common with the literature, however, the benefit of holding larger real money balances is assumed to encounter diminishing returns. Third, the cost of using any particular money will depend upon its perceived quality, $ß_k$.[13] A higher quality money is one whose future value is more predictable and hence more acceptable in exchange so that both holding and using such a money lowers the expected costs of trade to the individual. Finally, the value of using any money will also depend on the qualities of the other monies in the system and hence on the quality of the monetary exchange system as a whole, ß. In this sense the absence of a money clearing mechanism or an organized money exchange market would impose higher costs on each individual using money. Improvements in banking institutions and/or the mechanisms that coordinate banking will then confer joint benefits on participating banks and individual money holders.

With this background, the choice problem facing price taking individuals can be modelled as one of choosing the consumption quantities of J commodities and the particular money type to hold that maximizes

$$\upsilon(x_{ij}, M_{ik}) = U(x_{i1}.. x_{ij}) + ?[\Sigma p_{jk}x^e_{ij} + r_{Mk}M_{ik} + i_{hh}(p_kW_i - M_{ik}) - \Sigma p_{jk}x_{ij} - p_k t(v_i, M_{ik}/pk, ß_k, ß)], \tag{2}$$

where the utility function, U(.), is assumed to be strictly concave, and where the summations in the budget constraint are over the complete set of J consumption goods. The money choice requires the individual to compare the total utility generated by each of the M_k's and then choose the money that is individually best from the set of K alternatives. Because money enters the maximization problem only through the budget constraint, the individual will choose the money that best lowers trading costs.

The set of first order conditions for an internal optimum for ith individual who chooses to hold the kth money is

$$M‹/Mx_{ij} = 0 \quad Y \quad U_{Xij} = ?(p_{jk} + p_k t_v v_{Xij}) = ?p_{jk}(1 + (-1)^c t_v), \quad c = 1\ (2) \text{ for } x_{ij} < (>)\ x^e_{ij}, \ j = 1,2,..J, \qquad \textbf{(3)}$$

$$M‹/MM_{ik} = 0 \ Y \ (i_{hh} - r_{Mk}) = -\ t_{(Mk/p)}. \qquad \textbf{(4)}$$

Imposing the second order conditions, the set of J equations in (3) together with condition (4) for the optimum quantity of money (and the cost minimization criteria for the choice of the particular money, k) are sufficient to solve for the J + 1 unknowns given the set of commodity prices p_{1k}, ...p_{jk},..p_{Jk}, the kth money price index, p_k, the interest paid on the holdings of money k, r_{Mk}, and the return on the alternative to holding money, i_{hh}. Substituting the first order conditions back into the budget constraint results in the determination of the appropriate demand (and supply) functions.

Before continuing into the supply side of the model, it is worthwhile pausing to compare these results with the outcome that would be found under the more traditional (Walrasian) zero transaction cost case. First and most obvious, without putting money into the utility function there would be no demand for money in the zero transaction cost case. In addition, the marginal rate of substitution among commodities would always equal the real exchange rate (without a transaction cost wedge). Second, because in our model transactions costs increase with the volume of trade, the quantities of goods traded will be smaller than those traded in the zero transaction cost case. From (3), net demanders can be seen to face a higher price of purchasing goods while net suppliers realize a lower net price on selling (as compared to zero transaction cost case). It follows that to the extent that the use of a better money lowers these trading costs on the margin, money's use increases the volume of trade at the same time it increases the utility realized through trade.[14] Third, note that the wedge introduced by transactions costs has a different effect across the goods traded versus the goods consumed and, because individual trading plans differ, even uniform trading costs have a differential impact on individuals depending on their particular endowments and tastes. Because the same markup is applied to all traded goods, the presence of transactions costs reduces the quantity of goods traded but produces no substitution effect on the relative quantities of goods purchased (or sold).[15] Fourth, the particular money chosen is the one that generates the greatest savings and hence permits the largest possible consumption bundle.[16] Hence the substitution possibilities implied by the use of equation (4) define the individual's choice of the optimal quantity of money given that the kth money has been chosen. Cost minimization means that at some cost the individual will switch completely to holding another money. There is then a discontinuity in each individual's demand for any particular money. Because all individuals differ in their initial endowments and particular tastes, however, aggregation over all individuals can be expected to smooth out any discontinuity in the market demand curve for each of the K monies. Finally, note that the demand for the nominal quantity of the kth money, M_k, is determined only because the k money prices have been taken as given. That is, the analysis determines a real demand for money that is neutral, invariant to once-and-for-all proportional changes in the money stock and all k money prices.

Given uniform price taking behaviour by the N individuals, the above system is sufficient to solve for a set of market demand functions for each of the K monies (banks) assumed to be operating in the model. In general form, these can be written as

$$(M_k/p_k)^d = \Sigma(M_{ik}/p_k)^d = M/p[(i_{hh} - r_{Mk}), s_k, \beta_k, \beta, \text{endowments, distribution}], \quad i = 1,..N. \quad \textbf{(5)}$$

The demand for any particular bank money can be raised by raising the interest paid on its notes or deposits (so reducing the opportunity cost of holding), by increasing the services offered, and/or by making its future exchange value more predictable and so increasing its quality.[17] Finally, the demand for each bank money depends upon the quality of the banking system.[18] Improvements in that quality could come through a reduction in the variability of all bank money prices (or rates of inflation) or through institutional improvements in the exchangeability of bank monies.[19]

II. The Supply of Bank Money

In this model, banks supply notes (deposits) of quality, β_k, pay a pecuniary rate of return, r_{Mk}, and provide a level of services, s_k, to individual demanders and use the real resources acquired to relend to other households through bank loans or to purchase bonds, new or outstanding. Both are assumed to yield a net rate of return of i_k.[20] Banks are intermediaries, specialists in providing household liquidity, in seeking out location-specific lending opportunities, and in policing loan repayment. This specialization allows banks to offer households lower borrowing, higher lending rates while still realizing a net return that is higher than individuals can earn lending directly. The superiority of each bank, however, is limited by the extent of its local market--by its ability to locate reliable borrowers with superior repaying prospects. Scarce lending opportunities and costly funds imply that banks will undertake first their most profitable, least risky lending opportunities before moving on to less their promising alternatives. For each bank, then, the expected return decreases on the margin as a function the scale of its lending activity. This we capture by assuming that $i_k = i(\Re_k, M_k/p_k)$ with $i_{M/P} < 0$, where $\Re_k$ allows for some banks to have net advantages arising from different specializations. In the very short run, then, the bank can increase its nominal note issue by purchasing bonds or making new loans in terms of its notes (or deposits).[21] In the longer run, however, each bank can maintain a larger real volume of outstanding notes (real deposits) only if it can raise the marginal return received on the associated higher stock of outstanding loans or it can lower the cost of raising the permanently larger inflow of funds.

In the steady state, then, the kth bank will choose a rate of return to set on its deposits, r_{Mk}, a level of banking services to depositors, s_k, and the level of enforcement/coordination needed to maintain a money quality level, $ß_k$, in order to maximize

$$p_k(r_{Mk}, s_k, ß_k) = [i_k(M_k/p_k) - r_{Mk})](M_k/p_k) - c(M_k, s_k, ß_k) \qquad k = 1,2,...K \qquad \textbf{(6)}$$

where the first term in (6) represents the steady state flow of bank income and the second term, c(.), represents the real cost to the bank of producing distinctive real money balances (the notes (deposits), services, and quality underlying its demand for money). We follow the literature in assuming that the cost of producing physical bank notes (new deposits) is negligible so that the partial derivative $c_M = 0$. On the other hand, the cost of providing a higher level of service to depositors is positive as is the cost of structuring and enforcing the timing of loan repayments and bond purchases to maintain a higher level of quality control (produce less variability in its outstanding money issue and hence money prices). Both c_s and $c_{ßk} > 0$.[22]

Given continuity in the demand for money function in (5) and an expected level of aggregate quality, ß, the bank's first order conditions for an internal optimum for profit maximization are

$$Mp_k/Mr_{Mk} = 0 \;\; Y \;\; (i_k - r_{Mk})(M_k/p_k)_{r_M} + i_{M/p}(M_k/p_k)_{r_M}(M_k/p_k) = M_k/p_k, \qquad \textbf{(7)}$$

$$Mp_k/Ms_k = 0 \;\; Y \;\; (i_k - r_{Mk})(M_k/p_k)_{sk_k} + i_{M/p}(M_k/p_k)_{sk}(M_k/p_k) = c_s \qquad \textbf{(8)}$$

$$Mp_k/Mß_k = 0 \;\; Y \;\; (i_k - r_{Mk})(M_k/p_k)_{ß_k} + i_{M/p}(M_k/p_k)_{ß_k}(M_k/p_k) = c_{ß_k}. \qquad \textbf{(9)}$$

In each equation above, the left hand term represents the marginal benefit of changing one of the bank's control variables. In equation (7) it is the net benefit derived by raising the rate paid on bank notes (deposits); in (8), the benefit of raising the level of bank services; and in (9), the marginal benefit of raising the quality of bank's control over the variability of its money prices. All raise revenue by increasing the quantity of real balances households choose to hold (offset somewhat by the falling real return that banks can realize on the larger stock of outstanding loans it must maintain in relation to the higher level of deposits). The right hand side term represents the corresponding marginal cost. Given that the kth bank is viable, i.e., bank profits are non negative, diminishing returns in lowering transactions costs through larger real money holdings and increasing costs in maintaining these levels are sufficient to produce an internal solution for s_k and $ß_k$. The decreasing returns that the bank experiences when expanding its aggregate portfolio of loans reduces the net return to all bank strategies and keeps the marginal revenue associated with higher real balances positive in the first order condition for r_{Mk}.[23]

Given that (6) is nonnegative, equations (5) through (9) are sufficient to solve for the optimal levels of service and bank quality provided by bank k along with the rate it will offer on its notes (or deposits). The imposition of (5) through (9) for each bank together with the nonnegative profit condition yields a solution for each bank that remains open. The addition of the zero profit condition for the marginal bank allows the model to solve for the number of banks in a Nash equilibrium in which each bank optimally sets its bank rate, level of bank services and level of monetary control given the behaviour of its rivals. Through these individual decisions a level of aggregate bank quality is implied, a level that in equilibrium must be consistent with the perceived quality of the banking system that underlying the expected demand curves facing each bank. Because of the variety permitted in the model (both in terms of individuals demands and bank specialties), it is unlikely that only one bank will survive in equilibrium. Hence without loss of generality, we assume that the industry equilibrium consists of K banks, each offering a distinctive money, perhaps distinctive rates on its bank notes (deposits), service level, and optimal quality. Open entry into the banking industry implies that the K +1st potential entrant cannot earn normal profits.

Note that as thus far discussed, the model has solved only for the equilibrium level of *real* balances and that neither the nominal quantity of each bank money nor its price level can be determined separately. Because individuals have full information on the exchange value of each nominal unit (so that cheating on the future value of money is impossible) individuals will be indifferent to the nominal quantity/price level combination that yields the same level of real balances. Since nominal quantities can be produced at zero cost, banks are also indifferent to the quantity produced. In this case higher rates of change of nominal money (the faster depreciation of purchasing power) can be compensated for fully through higher nominal rates of return given to money holders and charged to money borrowers. In Klein's terms, the model produces a metastable equilibrium in which real values are fully determinate but the level and rate of change of each particular money price can be determined only through the addition of factors from outside of the model.[24]

What is less apparent from the discussion is that the model permits the existence of a number of different Nash equilibrium solutions (that can be Pareto ordered), depending in part on the initial beliefs held by individuals and banks on the level of aggregate bank quality present in the system. Over some range, the solution described above will not be unique and different sets of beliefs can be self-sustaining in equilibrium. Why this result can occur is best approached by considering more explicitly the requirements of the coordinating mechanism(s) needed to support multiple money exchange.

III. Hayek, the Money Exchange Market and the Transactions Approach

For a multiple money system to work, each bank money must be generally acceptable in trade and this is feasible only if there exists some mechanism(s) by which the monies acquired in commodity sales and not reused in contemporaneous purchases can be exchanged for the money chosen to be held over time. The extent of that service and its associated cost must be such that intermediated trade with money remains economic. It follows that an institutional framework coordinating money exchange with a level of aggregate service ß is implicit in the model discussed above. If transaction costs were zero it would matter not whether these services are provided by banks (through a clearing house arrangement), by individuals themselves, or by an independent agency that intermediates the different bank monies. As long as entry was open and service providers were distinguishable, the organizational form will evolve to provide this service at lowest cost. Somewhat arbitrarily, then, we begin our analysis by following Hayek in assuming that the low cost institutional solution will be an independently operated money exchange market for the K fiat bank monies. The level of that service money exchange service then feeds back into our analysis as aggregate bank quality, ß.[25]

In such a money exchange market, there will exist at each point in time an exchange ratio for each bank money in terms of each of the other bank monies. Should the same basket of goods be used to define the price index that measures the purchasing power of each bank's money, the exchange ratio will reflect directly the relative bank prices of the common basket of goods and hence relative purchasing power.[26] More explicitly, the exchange ratio between the monies of banks k and q will be e^k_q / the number of units of k's money per unit of q bank's money = p_k/p_q.

Given that all fluctuations in bank money prices increase (real) money trading costs, the transactions cost approach adopted is perhaps the natural way to introduce price level stability endogenously into the analysis. That is, because each individual holds money only to reduce trading costs and because these cost savings arise primarily from not having to subordinate consumption to exchange, any reduction in the number of relative price calculations needed to plan final trades and/or any reduction in the number of trades that variable prices induce will lower trading costs. It follows that any change in the underlying money exchange process that reduces the complexity of trading plans and frequency of inter-money exchange will increase the value of using that bank's money and so its demand. Stated alternatively, because the number of relative price calculations and commodity trades needed to maintain the constancy of real money holdings (and real consumption flows) increase with <u>both</u> the variance in money prices and divergence of the inflation rate on either side of zero, the transactions demand for money will fall even if the holder of the kth money is fully compensated for the perfectly predictable time cost of holding nominal units of the kth money.[27]

In the competition for customers, then, any bank that can provide greater price stability (not just greater predictability) will face a higher demand for its bank money. In this sense, our analysis would seem to concur with Hayek's belief that a competitive money system would result in stable as well as predictable money prices.[28] Under the constraint of competition, rival banks succeed and profit by providing the bundle of monetary characteristics – pecuniary return, level of bank service and level of money quality – demanded by their customers.[29] Even with full information, individual money holders prefer prices that are stable and competitive banks can deliver such an outcome in equilibrium.

Should all banks succeed in delivering price stability, the exchange ratios across all bank monies will remain constant. Moreover, any change in that exchange ratio would immediately indicate the inability or unwillingness of one bank (or both) to maintain the constancy of their relative purchasing power. Whether desired or not, changes in the money exchange ratio signal a change in relative bank performance and hence relative bank quality. With perfect information on all nominal magnitudes, the assumption maintained in this section, an additional source of information on bank quality generates no additional value. However, when actual and expected prices can diverge, the money exchange market can play an important information role in the functioning of a competitive money system. It is this policing role that exchange rate information can provide that underlies Hayek's belief that a competitive monetary system will also be a stable price system.[30]

IV. Individual and Aggregate Bank Quality in a Multi-Money Banking System

Were banks truly independent of each other, the net private and social cost of producing bank money would be equal and this would imply, in the absence of the cheating problem, that competition among banks could be relied upon to produce the socially optimal output bundle. This is the case implicit in Hayek's competitive result. On the other hand, the transactions perspective makes it apparent that banks are interdependent. Because aggregate quality depends upon the qualities of all the banks in the system, the benefit arising to any individual bank of establishing a level of bank quality will be a function of the quality levels adopted by the other banks in the system. Moreover, the aggregate benefit created will be shared. For the individual, the value of holding money depends ultimately upon what one can get in return and because a multi-money system necessitates the acquisition and resale of other bank monies, the benefit of holding any specific bank money will depend in part upon the quality of the money arising elsewhere in the system. In the same way that the cost of using a single bank money rises with its price variability (bank quality), the cost of using a multi-money banking system will rise with a rise in the variance of all bank money prices.

It follows that the holder of any particular bank money will be concerned with the stability both of that bank's specific money prices and other money prices relative to the chosen standard. Because less overall variability is desired, any particular bank faces a potential tradeoff in the competitive quest to win customers. Less variation in money prices can be produced by having the bank's inflation rate converge on the inflation rate adopted by the other banks in the system (in which case money exchange rates will remain constant) or by pursuing the greater stability of the price level of its own particular medium of exchange. It is because the pursuit of the latter can increase the former that price stability will not necessarily be the outcome that arises under market competition. The larger the numbers of competing banks, the more likely it is that convergence on inflation rates will dominate the incentive to target the level and variation of individual prices about zero.

These considerations suggest that there are at least three aspects to bank quality that merit attention: first, the aggregate variance of all money prices defined as the variance of the portfolio of individual bank variances;[31] second, the divergence of the particular bank's inflation rate relative to the mean rate of inflation; and third, the cost of operating the money exchange institution. That is,

$$ß = ß(s^{2}_{ß}, *p_k - p_{mean}*, C(mm)), \qquad \text{with } ß_s\ ß_{?\,k} \text{ and } ß_C < 0, \qquad \textbf{(10)}$$

where $s^{2}_{ß}$, p_k, and C(mm) represent, respectively, the variance of all bank money prices, the inflation rate of the kth bank, and the costs of operating the money exchange system.

While we have focussed on the potential tradeoff, the two ways of reducing aggregate price variation need not be incompatible so that the converge of all banks on price stability is indeed one possible Nash equilibrium. In addition, it is an equilibrium that will Pareto dominate the other Nash equilibria. Nevertheless, as will be shown more formally below, should banks have already converged on a low but non zero inflation rate, it may not pay any single bank to diverge from that initial position. That is, any single bank that chooses to diverge by producing a lower inflation rate to produce more stable own prices will immediately have its exchange rate appreciate relative to rivals. This in turn imposes on its money holders the higher cost of transacting over an ever widening range of expected future transaction prices. It is then likely that there will exist a range of common inflation rates from which the competitive bank will choose not to diverge, where the increased benefit to be derived from having a higher level of particular bank quality will be more than offset from the higher cost of producing a rate of price change that is out of step with the rest of the industry.[32] The inability to collude under competition keeps the banks from being able to lower the industry average to zero (while preserving industry convergence).

Because the aggregate quality of the banking system consists of the qualities of its individual parts, any change in one bank's inflation rate or bank quality will produce a direct effect on the aggregate quality utilized by all other banks in the banking system. This means that each bank will not receive all of the benefit created by its provision of higher individual quality and so will under-provide and tend to free-ride on the quality produced by others. From each bank's perspective, the cost saving that rises from any reduction in the provision of individual bank quality will be a complete private gain to the bank initiating that change while the overall loss in demand associated with lower aggregate bank quality is shared amongst all of the banks in the system.

The significance of this external effect on behaviour can be seen by allowing the total effect of a change in individual bank quality to be incorporated into the bank's first order condition. Allowing for the effect of individual bank quality, $ß_k$, on the quality of the banking system, ß, the first order condition in (9) (that held ß constant) now becomes

$$(i - r_{Mk})[(M_k/p_k)_{ßk} + \mathbf{(M_k/p_k)_ß ß_{ß_k}} + \mathbf{3_j(M_j/p_j)_ß ß_{ß_k}}\ ] + i_{M/p}(M_k/p_k)_{ßk}(M_k/p_k) = c_{ßk}, \quad j = 1..K,\ j...k, \quad \textbf{(11)}$$

where $ß_{ß_k} > 0$ and $(M_k/p_k)_ß > 0$. The second term in the square brackets represents the additional benefit created for money holders of bank k that was earlier ignored by the competitive bank that treated aggregate bank quality as a constant. By treating its effect on aggregate quality as negligible, the bank not only ignored its effect on demand through higher aggregate bank quality but also ignored the same sized effect it creates for the K - 1 other banks in the system. Because the value created for the banking system as a whole is larger than what can be captured by the initiating bank, the optimal level of bank quality for the banking system as a whole will be larger than the level arising in a competitive equilibrium. Competitive banks under-provide bank quality and this results in lower quality banks in equilibrium. Note that both banks and their customers lose from the inability to internalize the quality externality. Compared to the transaction costless case where such externalities were internalized, a competitive banking system under free entry would likely consist of smaller sized banks, each providing relatively more service and offering lower deposit rates.[33]

The importance of the bank quality externality and associated multiplicity of equilibria is that its presence creates an ongoing incentive for market participants to restructure property rights or adopt institutional/organizational innovations to internalize the externality and so avoid rent dissipation. For example, if the current banks could cooperate, all market participants (both existing banks and current money holders) could share in the rents created by a coordinated expansion of each bank's level of bank quality. From a transactions perspective, many institutional innovations in banking can be interpreted in just such a manner. For example, the evolution of the clearing-house system (as described by White) may be interpreted as one mechanism by which incumbent banks can coordinate simultaneous quality improvement while preventing and/or excluding free-riders. The adoption of money exchange at par and the use of the reflux mechanism to police the individual incentive to free-ride on aggregate quality allows coordinated bank action to traverse Nash equilibria and focus on the dominate zero inflation rate, stable price level solution.[34] In this sense, the mutual convertibility of bank monies at par with each other generates a mechanism for bringing about greater money quality. The transactions costs savings for both banks and their clients relative to the institutional alternative of coordinating monetary exchange through flexible, varying exchange prices suggests that this coordinating institution will dominate its competitor.

The alternative (or complementary) private mechanism for internalization is bank consolidation. Because each bank shares in an improvement in aggregate quality in relation to its share of the overall market, there is an incentive to capture more of the potential benefits through increased size, either through expansion or merger. The historical tendency for banks to consolidate within their market areas speaks to its ability to internalize ever larger portions of the network externalities present in banking. This tendency may be reinforced by the other technical scale economies often argued to be present in banking–for example, the ability to economize on money inventory holdings (à la Edgeworth) and the ability to combine sectors of the banking system whose synchronization of money inflows and outflows results in less aggregate variability when combined.[35]

Historically, internalization through consolidation has been resisted. Because the growth in market size often coincides with the growth of market power, what is gained through greater internalization of technical externalities may be lost through the incentive to reduce quantity artificially and raise the bid-ask spread in intermediation. In comparison, at least in the Scottish free-banking period, the ability to coordinate industry performance through a clearing house did not interfere with entry, innovation and a healthy and competitive banking environment (White, 1995).

V. Time Inconsistency and the Cheating Problem

The sections above argue that transaction cost considerations suggest that if a competitive banking system continues to operate through time, then such a banking system will evolve an institutional structure that will reinforce the individual bank's incentive to provide stable money prices. This is the theoretic underpinning for a bank clearing house system. It remains to drop the assumption that money holders can accurately foresee either the purchasing power of bank money or the quantity of bank notes outstanding. This reintroduces the threat that banks may profit by overexpanding the note issue and inflating faster than current money holders can anticipate. Hence even if competitive banks would produce stable prices if they continued to operate, a competitive money system will not be viable unless banks can credibly commit to continued performance at predictably stable money prices.

Costly information means that money holders will not always be able (nor will they care) to distinguish between episodes of deliberate short run deception and imperfect control and/or normal operating mistakes. Both impose a cost in terms of foregone bank performance and the predictable money value. However, recurring periods of short run deception cannot represent a viable long run solution strategy for competitive banking. Not only will any and all deliberate redistribution strategies become recognized, but the anticipation of being taken advantage of in the future will lead both banks and money holders to an equilibrium that incorporates sufficient safeguards to make long term cheating unprofitable.[36] What is true is that the necessary monitoring and enforcement actions taken will make that equilibrium viable more costly than if information could be provided and deception or mistake policed costlessly. For both parties jointly, the willingness of individuals to pay a premium for both stable and stationary money prices means that industry rents will be maximized when this level is provided in the most cost effective manner.

There remains the strategy of printing sufficient notes (issuing new deposits) in the short run that by the time discovery is realized, the income redistributed from current money holders will more than offset the present value of the gain that the bank could realize from adhering to traditional banking behaviour over the long run. In Klein and Leffler (1981), these tradeoff possibilities are set out formally and Klein (1975) argues that with distinct monies and flexible money exchange prices, brand name capital may be sufficient to overcome this cheating problem. In essence, the bank will post a bond in terms of specific capital that would be lost should an attempt at cheating be discovered. In White (1999, p. 236), this potential solution is challenged. For White the gain available from capitalizing on any temporary departure between actual and expected prices can be made infinite, making infinite monetary expansion the predictable profit maximizing outcome. If such an expansionary strategy becomes feasible, knowledge of that result will prevent a fiat money banking system from ever being established. For White (1999, p.239), the only viable alternative is for private issuers to write a contract obligating them to buy back their money at a predetermined rate, i.e., issue a redemption contract.

From a transactions perspective, what is missing from the above analysis is a demonstration of how a one-time ripoff can be managed economically. That is, given the traditional scale at which any bank can operate, an undiscovered instantaneous infinite expansion of a bank money might simply not be feasible. Rather, any sudden expansion of the note issue at a sufficient rate to realize the net redistributive gain necessary to offset the rent to continued normal behaviour might be detected before the gain to such deception could be fully realized. Given that no single agent is willing to hold even temporarily a very large, let alone infinite, quantity of any bank money, any deception strategy must be pursued in secret through transaction sizes small enough not to trigger immediate alarm. In this sense every episode of deception requires a strategy of misbehaviour taking place over real time that if detected would reveal the anticipated deception.

In Hayek's institutional case, where the money acquired in trade and not held by the individual is exchanged through the money market, any unanticipated increase in the volume of one bank's money will immediately result in a depreciation of its current exchange value. Without knowing the cause, the change in the exchange ratio signals overissuance. While day-to-day fluctuations in bank money values are expected, such expected fluctuations are already being evaluated relative to expected bank quality so that any unusual or "unexpected" depreciation in exchange value will trigger alarm and further depreciation. The exchange market is then Hayek's transmission mechanism for signalling performance and so permitting the penalization of banks that cannot fulfill their promise of price stability. Such a feedback limits the size of the redistributive gain that any initiating bank can realize. In the absence of costless honesty, sceptical money holders are protected by the bank's inability to transact a sufficient quantity of nominal money to realize a sufficient real gain given the time before such deliberate cheating is detected.[37]

The institutional alternative of coordinating money exchange through a bank clearing house system requires the mutual acceptance of each member's bank notes at a fixed rate of exchange (often par) and maintenance of the promise to redeem surrendered monies in terms of other bank monies. Here the cheating problem is revealed in terms of the gap between expected and actual clearing quantities rather than expected and actual prices. From a Coasean perspective, a clearing house arrangement requiring immediate redemption at fixed prices places liability for monitoring individual bank performance directly on the agents who first receive information of an overissue. That is, should an attempted infinite expansion be successful, the cost of cheating will fall primarily on the partner banks and the clearing house caught in the deception. More generally, because any reduction in aggregate money quality reduces the demand for each member's bank money when one bank free-rides on industry credibility, competitive banks collectively have an incentive to monitor each others behaviour rigorously. The reflux mechanism, by which bank liabilities that the public at large is unwilling to hold (at the fixed price) flow back to the issuing bank for redemption is then the mechanism by which free-riding is enforced and information on larger scale cheating is revealed. Under competition, banks both individually and collectively can be counted upon to monitor each others performance.

For nonbank money holders who are protected from individual bank expansion by such diligence, the more general fear is that neither of the two information institutions signal an attempt by banks collectively from expanding at the expense of their nonbank customers. In this case neither the net clearings of the bank clearing house nor the exchange values of one money relative to each other can be relied upon to signal the unexpected depreciation of all bank monies. It is in relation to this latter problem that a competitive money system may require further anchoring.

As mentioned earlier, it is White's belief that a bank's promise to maintain the stable purchasing power of its money is not credible so that any contract based on this promise is not be viable. Rather, bank money becomes credible only when each bank writes a contract binding them to buy back their issued money on demand at a price fixed in terms of something real--i.e. by making money redeemable or convertible into some outside good(s) at a predictably fixed exchange rate.[38] It follows that when all banks maintain this promise with respect to an outside good (or group of goods), price level stability is maintained not only for each bank individually but also for the banking system as a whole.[39] For White this is viable because the convertibility promise can be enforced while other such promises, such as the promise to maintain constant purchasing power or a given rate of growth of bank money, cannot be enforced. In principle, however, any promise (contract) can be cheated upon and any departure between an expected and actual value can be used to redistribute large (potentially infinite) amunts of wealth. What is then implicit in White's position is not that cheating on a convertibility contract is impossible, but that such cheating will be discovered before sufficient wealth can be redistributed to make the action worthwhile. In essence, enough behavioural information is revealed so that the gap between expected and actual prices closes fast enough to keep losses below the return that can be earned by maintaining the promise.[40] Knowing this the strategy is not undertaken and both banks and bank money retain credibility.

VI. Indirect Convertibility as a Rule for Bank Credibility

White's suggestion that one particular type of bank contract guaranteeing price stability is enforceable while others are not directs attention towards the behaviour that would signal cheating and hence the information required to enforce each contractual alternative. In this sense even White's proposed solution is not encouraging. While convertibility on demand immediately withdraws bank reserves and so indicates whether the bank's outstanding note issue is backed with sufficient reserves, the information needed before a sceptical money holder chooses to challenge the bank's issuing practice is much more vague and nebulous. For example, should individual money holders look only at actual relative to "implicitly" promised price levels before choosing to redeem their money holdings, then the promise of convertibility will be no protection from cheating if there is a sufficient lag between the money supply increase and the resulting price change. The maintenance of the promise to redeem on demand until the damage is revealed is part of the initial fraud and comes too late to prevent the issuer from profiting from the strategy.

The theoretic import of White's observation that only convertibility contracts have been successful in practice is that this mechanism for enforcing bank behaviour does not rely the revelation of a gap between expected and actual prices to be activated. Should deceptive behaviour be suspected, the remedy of withdrawl can be effected before the outcome can be realized, so rewarding early detectors. It is the ability to act prior to the revelation of unexpected high prices that allows the vaguer promise of price level stability by each bank to be monitored more effectively and hence makes the convertibility contract more credible. On the other hand, the reflux mechanism that polices bank performance relies primarily on other banks to quickly signal incompetence and/or deception. Such a system gives much less protection to outside money holders when the system expands in concert. In such cases, individual money holders must monitor the loss of aggregate purchasing power which harder for them to detect and again tends to be revealed only after the redistribution at their expense has taken place.

This latter consideration suggests that if the money creation process in a competitive banking system could be made more transparent and predictable so that possibly fraudulent behaviour could be detected much earlier and hence made less profitable, the promise of price level stability would be more reliable and may become enforceable economically. For these reasons a contractual banking arrangement such as that provided under indirect convertibility may well provide a superior institutional context for guaranteeing price stability than does the fixed price-convertibility on demand contract advocated by White.[41] Indirect convertibility, i.e., the adoption of a money rule by a bank that promises price stability through the requirement to buy and sell its bank money into an outside nonbank commodity (or financial asset) at favourable market terms whenever an independent forecast of its money prices diverges from its stability target, allows for ex ante observations that allow for not only the external monitoring of relative bank performance (as does fixed price convertibility) but also the assessment of absolute performance (the probability of maintaining the promise of stable money prices). The adoption of an indirect convertibility contract by banks requires each to fulfil a series of well specified actions whenever publicly transmitted forecasts of expected future bank prices, rather than simply current prices, diverge from target. Non compliance in any one of these required actions then signals immediately the unwillingness of the bank to maintain its commitment well in advance of the results of noncompliance showing up in the market. It is then the ability or inability of the bank to follow the rule that allows intentions to be inferred and hence allows the gap between expected and actual prices to be closed more quickly than otherwise. Indirect convertibility provides the rules under which observable actions sufficient to maintain price stability can be generated and this means that expected prices can then be conditioned on observed behaviour. In just such a way can bank price expectations be endogenized to minimize the size of the potential loss that could be realized through cheating. Because the indirect convertibility rule completely specifies acceptable banking behaviour, unacceptable bank behaviour is more easily observed so that mistakes or deceptions are more easily and quickly discovered. The profit maximizing promise of price stability becomes more credible because the process of money supply creation is more transparent and open to external evaluators.

VII. Conclusion

In this paper the case made by Klein and Hayek for a competitive banking system without government's necessary involvement was reexamined and found to be coherent and feasible but somewhat incomplete. In particular, I have argued that a transactions perspective can be used to fill in the gaps and underline the information and enforcement environment needed to make the promise of a stable money credible. To do so I have argued that a fixed price, convertibility-on-demand contract is not sufficient to create and/or maintain credibility. Rather the convertibility requirement must be combined with potentially observable information that could signalling fraudulent behaviour so that enforcers can anticipate forthcoming increases in product prices. In this sense a money rule such as that supplied by indirect convertibility can supplement the many strengths of the on-demand convertibility contract recognized by White in his case for free banking.

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Notes

1. The ideas in this paper grew out of a series of discussions with Jack Galbraith on the contributions of Hayek, Klein and White. While our differences in detail are sufficient to merit separate analysis, there is no doubt that my analysis would not developed without his stimulating criticism.

2. I focus on money's role in relation to trade rather than production and/or accumulation. In a more general model, banks would specialize in funding location-specific investment projects by firms à la Chant (1992).

3. Note that Klein does this explicitly (p.424) whereas Hayek assumes that the cheating problem is overcome relatively easily. For example, Hayek writes that "[a]s soon as the public became familiar with the new possibilities, any deviation from the straight path of providing an honest money would at once lead to the rapid displacement of the offending currency by others".

4. With all exchange prices known, the fiat monies assumed to be present and used in this model are all equally credible, redeemable and convertible. The problem of bank credibility and the question of whether fiat bank monies can have positive value is then an information cost problem. How best this problem is solved is the subject of Section V.

5. See, for example, the papers in Starr (1989).

6. See Alchian (1977).

7. Different services may appeal to different customers as a function of their anticipated trading volume and/or type of transaction.

8. In this model it is assumed that the return on savings available to the household, $i_{hh,}$ is a constant that is more than would be received when holding bank money, r_{mk}, and less than any particular bank can earn on its nonliquid asset, i_j. Hence we assume that $i_j > i_{hh} > r_{mk}$. This reflects the assumed transaction cost structure where banks specialize in finding suitable lending opportunities and face lower costs than do households of discovering, monitoring and policing these location-specific opportunities. For a more general and well developed analysis along these lines see Chant (1992).

9. In Hayek's analysis, individual banks can choose different baskets of goods on which sell "price stability" and this becomes another element of competition. Our analysis assumes that to make comparisons across different monies, money prices are all calculated relative to the same bundle of goods. Hence p_k measures the number of units of K's monies required to purchase a unique bundle of consumption goods.

10. Note that for an individual using money k, Mv_i/Mx_{ij} / $v_{Xij} = (p_{jk}/p_k)\{(x_{ij} - x^e_{ij})/[(x_{ij} - x^e_{ij})^2]^{1/2}\}$. Note that the numerator and denominator of the term in curly brackets are of the same absolute value.

However the denominator is always positive while the numerator can be positive or negative depending upon whether $x_{ij} > x^e_{ij}$ or $x_{ij} < x^e_{ij}$. Thus $v_{Xij} = (-1)^c(p_{jk}/p_k)$ where c = 1 if $x_{ij} < x^e_{ij}$ and c = 2 if $x_{ij} > x^e_{ij}$.

11. See Jones (1976).

12. See, for example, Fried (1970) on the shopping demand for money and Whalen (1981) and Ferris (1981) on the precautionary demand for money.

13. We follow Klein in defining bank quality as the variance of the bank’s money prices.

14. This requires either M_{ik}/p_k, ß$_k$, or ß to effect t_v. The first link is the ususal way that money is introduced into a model (see Savings, for example). But the same reasoning suggests that increases in both ß$_k$ and ß will have similar effects, either directly or indirectly through their effect on holdings of M_{ik}/p_k.

15. For two goods, j and m, the marginal rate of substitution can be found from(3) to be $U_{Xij}/U_{Xim} = p_{jk}(1 + (-1)^c t_v)/p_{jm}(1 + (-1)^c t_v)$. Hence for two goods that are either both purchased or both being sold, the common transaction cost term will cancel out of the relative price. Hence abstracting from income effects, the same relative quantities of the two goods will be chosen as in the zero transaction cost case. However, when the comparison is across goods where one is being sold and the other being purchased, the wedge is compounding in its effect. Because individuals differ by initial endowments and tastes, types and quantities of money demanded may differ across individuals who face common transactions costs and commodity prices.

16. This is the equivalent of equation (12.1) in White’s model of Klein (White, 1999, p.229).

17. We follow Klein in thinking of a specific bank’s money quality in terms of the variance (rather than level) of its money prices. Expected changes in the price level and its rate of change of prices can (and will) be compensated for in the money rate of return paid in k denominated notes (accounts). A less predictable money with the same expected value has more risk and hence is of lower quality (at the same price).

18. Given the definition of bank quality it would be natural to think of the quality of the banking system as a whole as the variance of a portfolio of different bank prices where the weights in the portfolio correspond to the real share of that bank money in the aggregate transactions undertaken in the economy. That is,

ß / Variance (ß$_k$’s) / $s^2_ß = 3_k s_k^2 s^2_k + 3_j\ 3_k 2 s_j s_k s_j s_k ?_{jk}$, where k, j = 1,...K, and j ...k,

where s^2_k is the variance of bank k’s money prices (bank k quality), s_k is the share of bank k money in the aggregate money supply, and $?_{jk}$ is the coefficient of correlation between the money prices of bank j and bank k. Note that for subgroups of banks, the variance of the portfolio could be smaller than the weighted sum of individual variances. This would arise if period-specific prices are negatively correlated across banks. In section IV below we show that aggregate quality will involve more than just this consideration.

19. In terms of the demand for money function developed thus far, a key difference between the approaches of Hayek and Klein is Hayek's tendency to assume independence among the demands for bank monies [in our terminology, $(M/p)_{ß} = 0$] while Klein tends to emphasize (exaggerate?) the externality present in this effect.

20. For our analysis the gross interest rate, i, set on bonds and/or loans is treated as exogenous. More generally i is determined in the aggregate market for bank loans, where all banks compete for business across adjacent boundaries with competitor banks and final consumers (who can always lend directly).

21. The ability to acquire resources by issuing notes or loans on the expectation of a price level that cannot be sustained is the cheating incentive facing banks and their customers. Our starting information assumption rules away this cheating possibility. We reconsider this possibility in later sections.

22. We also assume that these costs are increase at an increasing rate so that c_{ss} and $c_{ßß}$ are also positive. Although we have not specified a distinctive cost function for each bank, there would be no new problem introduced by allowing each bank to have distinctive characteristics that translate into cost differences. In all cases, however, we would still require it to be increasingly costly to provide higher levels of service and price quality.

23. By dividing (7) by $(M_k/p_k)_{r^k}$, (8) by $(M_k/p_k)_{s^k}$, and (9) by $(M_k/p_k)_{ß^k}$ it can be seen that at the optimum, the marginal cost of adding another real balance through either pecuniary return, level of service, or bank quality will be equalized.

24. When one approaches the demand for money through the utility function, as does Klein (and many others), it is perhaps natural to see the avoidance of the cheating problem as the additional way by which either a determinate price level or a determinate rate of change of money prices can be introduced into the analysis. We argue below that the transactions perspective leads more naturally to a demand for price stability as well as predictability.

25. If transactions costs are ignored, the assumption of perfect information on nominal quantities and prices leaves little to distinguish between a banking system that fixes nominal prices and maintains real values through a nominal bank clearing mechanism (White's note exchange) versus one that allows money prices to vary and uses banks competition for customers to determine the nominal quantity that results in the desired level of real balances. Our case for the transactions approach is that the choice between these clearing arrangements is only partly dependent on the information problem that is here temporarily suppressed. We return to this issue in Section V where information is costly and deception is possible.

26. While there is no need for individual banks or individual groups of bank customers to choose the same basket in which to either target or measure the purchasing power of each bank's money,

comparability across monies becomes easier when the same basket is used. For this reason we proceed under the assumption that there is agreement on the bundle of goods whose price level is stabilized.

27. This generalizes the traditional transaction cost reasoning for why money holders prefer the single money that has the lowest price variance about any predictable rate of growth.

28. In Hayek's words (1976, p.29) ,"...there is no reason to doubt that private enterprise whose business depended on succeeding in the attempt could keep stable the value of a money it issued."

29. While we argue that all customers will prefer price level stability, customers can vary in their preference for service versus pecuniary return. Hence in the absence of strong economies of scale, there is no particular reason to expect that a homogenous bank will emerge in equilibrium.

30. Hayek writes (1976, p. 43), "And it should be in the power of each issuer of a distinct currency to regulate its quantity so as to make it most acceptable to the public – and competition would force him to do so. Indeed, he would know that the penalty for failing to fulfill the expectations raised would be the prompt loss of the business".

31. See footnote 18.

32. Note that the increase in transactions costs through lower industry quality is distributed asymmetrically for customers of the single bank that chooses to diverge from the standard industry inflation rate. Because the diverging bank it is small relative to the market, its customers will find that the majority of their transactions are in terms of new prices while the customers of other banks will find only a small subset of their transaction prices will have changed.

33. Note that the number and size of firms in the competitive equilibrium could be larger or smaller than the socially optimal norm, depending on the size of the aggregate quality effect and on whether services and quality are substitutes or complements in consumption.

34. In terms of the model, the requirement of mutual convertibility at par means that $p_k - p_{mean} = 0$ and mutual adaption to $p = 0$ means that spillover effects of improved individual bank quality are reciprocated by each of the other banks in the system. Note that a clearing-house system requires banks either to hold each other's notes as reserves or to use some third commodity (e.g. gold) to handle inter bank settlements.

35. If consolidation reduces the number of market participants sufficiently and raises the scale required of entrants such that entry control can now be realized, the incentive facing incumbents may well turn to realizing the more typical monopoly returns associated with regulated entry. There is then a ongoing tension between effects of greater bank cooperation on the incentive to internalize market externalities and the incentive to use the resulting market power.

36. That is, time inconsistency does not exclude the possibility that there exists a competitive equilibrium in which cheating will not arise. Such an equilibrium would appear to be dominated by one where cheating is not possible, but such an equilibrium assumes (counterfactually) that cheating is costless to prevent.

37. Flexible exchange rates across bank monies allows more independence to individual banks and so imposes more of the detection costs on individual money holders. Given that information costs of monitoring bank performance are nonrival, the costs of organizing individual money holders may encourage free-riding and hence result in underprovision.

38. In White's analysis, the case for convertibility is self evident. He writes (1989, p.20), "Within a free-banking system, where there are many issuing banks but no government sponsored central bank, convertibility prevails naturally without any legislature imposing it. Convertibility arises simply from the contract agreement made by each issuer on the face of each note to redeem that note on demand for a specific quantity of specie."

39. With all banks successfully pursuing price stability, the exchange ratio across bank monies would remain constant so that a clearing arrangement across banks then becomes feasible.

40. Prior to the clearing arrangement, however, individual customers must monitor bank behaviour so that the "on demand" clause becomes the mechanism for policing bank credibility.

41. For more on indirect convertibility and its relative strength in maintaining an inflation target see Ferris and Galbraith (2002).