Ricardo Versus Thornton on the Appropriate Monetary Response to Supply Shocks

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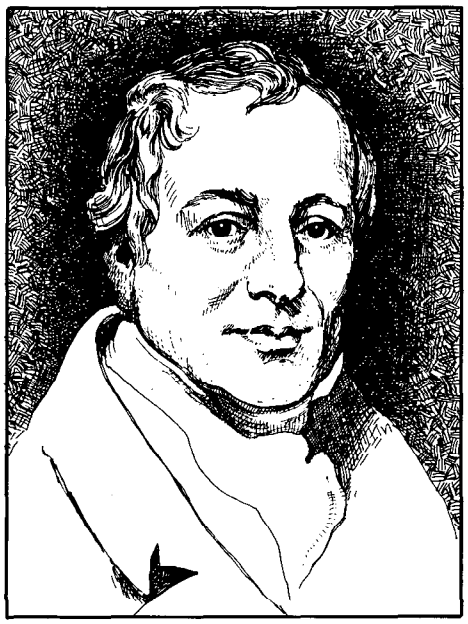
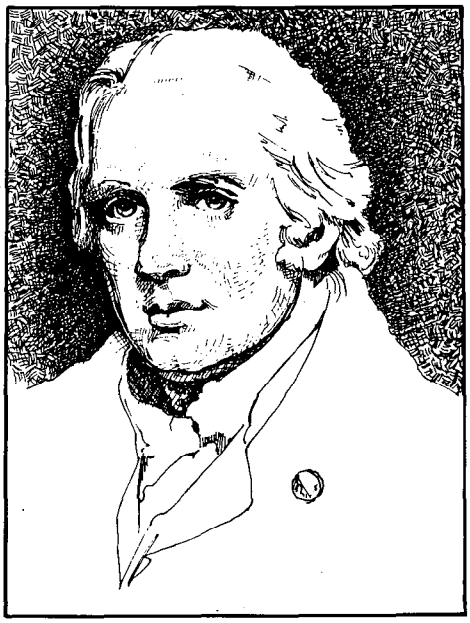


David Ricardo (1772-1823)



Henry Thornton (1760-1815)

Introduction: Supply Shocks and Policy Choices

Exogenous supply disturbances such as the recent Iraqi oil shock deliver a double blow to the economy. By rendering material or energy inputs scarcer and dearer, they raise production costs per unit of output. In so doing they discourage production and raise product prices. The resulting rise in the general price level shrinks the buying power of spenders' money balances, thus reducing the aggregate demand for real output. Real activity slackens as prices rise.

Of course the adverse price and output effects of a supply shock would hardly be expected to last forever. For the depressed levels of output and employment would put downward pressure on wage rates. And the resulting fall in wages would tend to countervail the impact of dearer energy and material inputs on production costs, thereby restoring aggregate prices, output, and employment to their pre-shock levels. If wages are downwardly sticky, however, such adjustment cannot be instantaneous. During the interim the economy feels the effects of the shock.[1]

Because supply shocks are painful, they raise the question of the appropriate monetary response. What, if anything, should the central bank do to counter the adverse price and output effects of a shock? Essentially the policymakers' choices are three. They can leave monetary policy unchanged and do nothing to mitigate the shock. Alternatively they can accommodate the shock with expansionary policy in an effort to dampen its depressive output effects. Finally, they can employ contractionary policy to reverse the price rise caused by the shock. Of these alternatives, expansionary policy runs the risk of

[1] For more on the conventional sticky wage analysis of supply shocks and their policy implications see Bruno and Sachs (1985), Dornbusch and Fischer (1984), Feldstein (1990), Fischer (1985), Gordon (1981), Mishkin (1989), Shapiro (1987), and Solow (1980). The present section draws heavily from these sources.

putting further upward pressure on prices. By contrast, contractionary policy risks worsening the recession caused by the shock. A policy of holding the money stock constant of course avoids these risks, albeit at the cost of ameliorating neither of the shock's adverse effects.

Which of the foregoing alternatives will the policymakers select? Their choice will depend to some degree on their belief in the neutrality or non-neutrality of money stock changes on real output and employment. Those believing in money's short- as well as long-run neutrality will opt for contractionary policy. They will reason that if money has no real effects, then expansionary policy is powerless to stimulate real activity whereas contractionary policy can stabilize prices at their pre-shock level at the cost of no additional lost output and employment. Since stable prices reduce business risk and uncertainty, contractionary policy will be judged the best.

Contrariwise, policymakers believing in money's short-run non-neutrality will opt either for expansionary or constant money-stock policies. Expansionary policy will be selected if its beneficial output and employment effects are judged to exceed its inflation costs. Only if those costs are seen to outweigh the benefits will expansionary policy be rejected in favor of constant money-stock policy. Seldom will contractionary policy be chosen by believers in money's non-neutrality. Given that such policy produces additional output losses on top of those already caused by the shock, it will be regarded as too costly to conduct.

That supply shocks may require different monetary responses depending on the neutrality or non-neutrality of money is hardly a new idea. It was thoroughly established in the writings of David Ricardo and Henry Thornton in the first decade of the nineteenth century. Ricardo, a strict believer in money's long- and short-run neutrality with respect to output and employment, argued that supply shocks should be countered with monetary contraction.[2] Thornton, a believer in money's short-run non-neutrality, opposed monetary contraction and argued instead that the money stock should be held constant in the face of supply shocks. Both parties agreed that money has no long-run (permanent) real effects. On this matter Thornton was every bit as much a strict classical quantity theorist as Ricardo. At issue was the short-run (temporary) non-neutrality of money. The following paragraphs show how this issue influenced the respective policy prescriptions of Ricardo and Thornton just as it undoubtedly continues to influence the Fed's response to oil shocks today.

David Ricardo's Analysis

Textbook allegations to the contrary, economic analysis of supply shocks and the appropriate policy response did not begin with the OPEC price hikes of 1973-74.[3] As early as the first decade of the nineteenth century, David Ricardo (1772-1823) and Henry Thornton (1760-1815), the preeminent monetary theorists of the English Classical School, analyzed such shocks in the form of harvest failures. They were particularly concerned with how to deal with external gold drains triggered by the impact of bad harvests on domestic monetary requirements and the balance of payments. At issue was whether such drains should be allowed to contract the money supply and bring prices back to their pre-shock level.

Ricardo argued that they should. Assuming a given initial money stock, his argument was that English harvest failures would, by reducing real output and thus raising general prices, lower money's purchasing power in England relative to its purchasing power abroad. Traders would then find it advantageous to ship monetary gold abroad to where its value was highest. Ricardo maintained that the resulting gold drain should be allowed to contract the English money stock until prices fell to their pre-shock level. In terms of the equation of exchange $P = MV/Q$, with velocity V constant, the shock-induced fall in real output Q requires an equiproportionate reduction in money M to stabilize prices P at their pre-shock level.[4] As Ricardo put

[2] Ricardo was not always consistent on the neutrality proposition. In certain isolated passages (for example, *Works*, III, 94) he remarked that sudden and sharp contraction can bring painful real effects which only gradual contraction can avoid. His remarks have been interpreted as a rejection of the short-run neutrality proposition [Ahiakpor (1985), Hollander (1979)]. More likely they are mere exceptions or minor qualifications to it [de Vivo (1987), p. 189), O'Brien (1981, p. 371), Peake (1978)]. Generally he adhered to the neutrality proposition and made no distinction between the short run and the long. The proposition's prevalence in the bulk of his monetary writing supports O'Brien's (1975, p. 164) judgment that "Ricardo, focusing as usual on successive periods of long-run equilibrium, denied the damage of deflation and the stimulating effect of rising prices."

[3] See Barro (1990, p. 114) and Gordon (1981, p. 17) for textbook statements identifying 1973 as the year when supply-shock analysis became important to macroeconomists.

[4] Ricardo's use of the exchange equation to analyze aggregate price determination is well known. In his notes on Jeremy Bentham's manuscript "Sur Les Prix" he wrote: "May we not . . . put the mass of commodities of all sorts on one side of the line,—and the amount of money multiplied by the rapidity of its circulation on the other. Is not this in all cases the regulator of prices?" (*Works*, III, 311) Here is a precise verbal statement of the equation $P = MV/Q$.

it in the Appendix to the fourth edition of his *The High Price of Bullion, A Proof of the Depreciation of Bank Notes*:

> England, in consequence of a bad harvest, would come under the case . . . of a country having been deprived of a part of its commodities, and therefore requiring a diminished amount of circulating medium. The currency which was before equal to her payments would now become superabundant and relatively cheap, in . . . proportion . . . of her diminished production; the exportation of this sum, therefore, would restore the value of her currency to the value of the currencies of other countries (*Works*, III, 106).

In prescribing monetary contraction, Ricardo assumed money's output and employment effects were negligible so that contraction would not amplify the depressive impact of the shock. His policy prescription manifested his belief in the neutrality of money.

That same belief led him to reject expansionary remedies. Such remedies purport to stimulate production thereby counteracting, wholly or partially, the output losses due to the shock. In Ricardo's view, however, monetary accommodation could no more relieve the real effects of a shock than contraction could exacerbate them. "Money," he said, "cannot call forth goods" (*Works*, III, 301). Likewise, when asked to give his opinion on the output stimulus provided by "fictitious capital," a then-current euphemism for monetary expansion, Ricardo replied: "I believe that on this Subject I differ from most other People. I do not think that any Stimulus is given to Production by the Use of fictitious Capital, as it is called," arising from extra issues of money (*Works*, V, 446).

To be effective, such overissue must inflate product prices faster than it does money wages with the resulting fall in real wages and corresponding rise in real profits inducing employers to hire extra labor to expand production. According to Ricardo, however, money wage flexibility prevents this outcome. Indeed, wages adjust virtually as rapidly as prices to monetary change so that lags of wages behind prices are but fleeting phenomena. In his own words:

> There is but one way in which an increase of money no matter how it be introduced into the society, can augment riches, viz at the expense of the wages of labour; till the wages of labour have found their level with the increased prices which the commodities will have experienced, there will be so much additional revenue to the manufacturer and farmer; they will obtain an increased price for their commodities, and can whilst wages do not increase employ an additional number of hands, so that the real riches of the country will be somewhat augmented. A productive labourer will produce something more than before relatively to his consumption, *but this can be only of momentary duration* (*Works*, III, 318-19, emphasis added).

In short, wage-price flexibility renders monetary stimulus powerless to cushion real shocks.

Ricardo Diagrammed

Writing more than sixty years before the invention of supply and demand curves, Ricardo expressed himself in words and numerical examples rather than in geometrical diagrams. Nevertheless it may be useful to illustrate his analysis with the aid of conventional aggregate demand and supply schedules located in price-output space (see Figure 1). Drawn for a given nominal money stock, the aggregate demand schedule slopes downward because of a real balance effect on expenditure: a fall in prices raises real cash balances thereby increasing the quantity of goods demanded. The vertical aggregate supply schedule reflects Ricardo's assumption of the neutrality of money: given perfect wage-price flexibility, the quantity of output supplied is invariant to changes in money and hence prices.

Starting from initial demand-supply equilibrium at point A, a harvest failure shifts the aggregate supply schedule to the left. Equilibrium moves to point B along the initial demand schedule yielding lower output and higher prices. Monetary contraction then shifts the aggregate demand schedule downward. Equilibrium moves to point C where prices are restored to their pre-shock level. Monetary contraction has no effect on output but stabilizes prices at their pre-shock level.

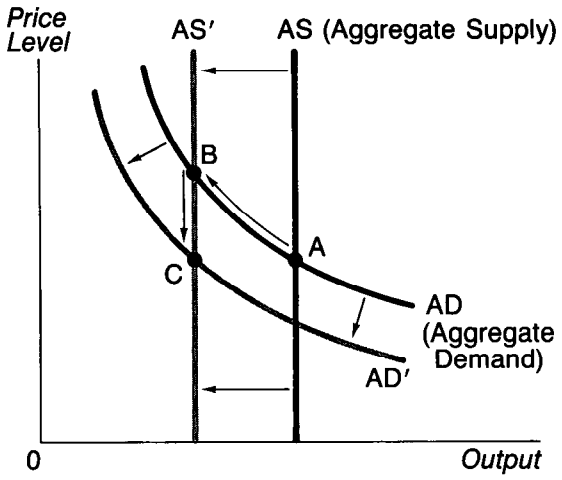
By the same token, monetary expansion and the resulting rightward shift in the demand curve would do nothing to counter the output loss of the shock. It would merely move the price level to a higher point along the shock-displaced supply curve with no corresponding rise in output. Since price stability in the face of the shock can be costlessly attained whereas monetary expansion and inflated prices yield no benefits, contractionary policy is preferred.

Henry Thornton's Analysis

Opposed to Ricardo was Henry Thornton, banker, member of Parliament, philanthropist who before his marriage donated six-sevenths of his considerable income to charity and at least one-fourth thereafter, and author of the classic *An Enquiry into the Nature and Effects of the Paper Credit of Great Britain* (1802). Thornton objected to Ricardo's prescription of

Figure 1

RICARDO'S ARGUMENT



Along the aggregate demand curve, rising prices shrink real cash balances and thus the quantity of goods demanded. Perfect wage-price flexibility fixes the aggregate supply curve at the actual (and potential) level of output. Point A denotes initial supply-demand equilibrium. A crop failure shifts the supply curve leftward. Equilibrium moves to point B with lower output and higher prices. Monetary contraction then shifts the demand curve downward. Equilibrium moves to point C where prices are stabilized at their pre-shock level with no additional loss of output. Ricardo's conclusion: Since price stability can be costlessly attained, crop failures should be countered with monetary contraction.

monetary contraction. He argued that at a very minimum the money stock should be held constant in the face of real shocks. He agreed that harvest failures and raw material shortages would, by boosting production costs, act to raise prices. "[B]ad harvests," he wrote, "by raising the price of bread, have in some degree lifted up that of labour, and of all commodities. Our prices may have also been partly augmented by the enhancement of the cost of raw materials brought from other countries" (1802, p. 263).

Besides raising prices, crop failures, Thornton noted, would necessitate extraordinary imports of food paid for by exports of monetary gold. But he did not agree with Ricardo that the gold drain should be allowed to contract the money stock. Believing as he did in the short-run non-neutrality of money, Thornton was convinced that monetary contraction was hardly the proper way to deal with adverse supply shocks. He thought that money wages were sticky and adjusted sluggishly in response to price falls such that when those falls occurred real wages would rise to inhibit economic activity. For this reason he maintained that monetary contraction risked the danger of disrupting markets and causing further falls in output and employment. As he put it in his *Paper Credit*, monetary contraction and the resulting

> diminution in the *price* of manufactures . . . may also, if carried very far, produce a suspension of the labour of those who fabricate them. The masters naturally turn off their hands when they find their article selling exceedingly ill. It is true, that if we could suppose the diminution of bank paper to produce permanently a diminution in the value of all articles whatsoever, and a diminution, as it would then be fair that it should do, in the rate of wages also, the encouragement to future manufactures would be the same, though there would be a loss on the stock in hand. The tendency, however, of a very great and sudden reduction of the accustomed number of bank notes, is to create an *unusual* and *temporary* distress, and a fall of price arising from that distress. But a fall arising from temporary distress, will be attended probably with no correspondent fall in the rate of wages; for the fall of price, and the distress, will be understood to be temporary, and the rate of wages, we know, is not so variable as the price of goods. There is reason, therefore, to fear that the unnatural and extraordinary low price arising from the sort of distress of which we now speak, would occasion much discouragement of the fabrication of manufactures (1802, pp. 118-19).

To avoid this danger, he favored offsetting or sterilizing the gold outflow with compensating note issues by the Bank of England. The additional paper would go to replace the departed gold, thus maintaining constancy in the money stock. He was even willing to risk temporary suspension of the gold standard rather than contract the money supply in the face of supply shocks. To him, inconvertibility and the consequent inability to redeem paper in gold at a fixed price on demand was preferable to monetary contraction. Particularly so when such contraction, by disrupting real activity, would impair the economy's ability to generate export surpluses that would be paid for by specie inflows upon the post-shock return to gold. To put the economy through the wringer of monetary contraction, he said, is to compel

> the manufacturer, on account of the unusual scarcity of money . . . to slacken, if not suspend, his operations. To inflict such a pressure on the mercantile world as necessarily causes an intermission of manufacturing labour, is obviously not the way to increase that exportable produce, by the excess of which, above the imported articles, gold is to be brought into the country (1802, p. 118).

Sources of Non-Neutrality

Although Thornton opposed monetary contraction, he did not go to the opposite extreme and

advocate expansionary monetary policy to accommodate supply shocks. To be sure, he admitted that such expansion could stimulate output and employment temporarily, thus dampening the real effects of the shocks. These stimulative effects, he said, came from three sources.

First were sellers' efforts to maintain fixed inventory-to-sales ratios. Their efforts, which ensured that any money-induced rise in sales would be matched by a corresponding rise in production for inventory, were described by Thornton as follows:

> It may be said . . . and not untruly, that an encreased issue of paper tends to produce a more brisk demand for the existing goods, and a somewhat more prompt consumption of them; that the more prompt consumption supposes a diminution of the ordinary stock, and the application of that part of it, which is consumed, to the purpose of giving life to fresh industry; that the fresh industry thus excited will be the means of gradually creating additional stock, which will serve to replace the stock by which the industry had been supported; and that the new circulating medium will, in this manner, create for itself much new employment (1802, p. 237).

Second was lagged wage adjustment which ensured that a monetary stimulus would temporarily raise prices relative to wages. As pointed out by Jurg Niehans (1990, p. 108), Thornton held that wages were set for extended periods of time whereas prices related to instantaneous transactions. This meant that wages were less volatile than prices and thus less responsive to monetary impulses. Consequently monetary expansion would produce a larger initial rise of prices than wages. The resulting fall in real wages would spur real output and employment.

Third was the shift in real income from wage earners to profit recipients caused by the lag of wages behind prices. Because profit recipients tended to save and invest more than wage earners, this income shift would encourage capital formation thus increasing actual and capacity real output. Here is the origin of the famous *forced saving doctrine* according to which the redistributive effects of inflation divert resources from consumption to investment. Of these forced saving effects, Thornton (1802, p. 239) wrote:

> It must be also admitted, that, provided we assume an excessive issue of paper to lift up, as it may for a time, the cost of goods though not the price of labour, some augmentation of stock will be the consequence; for the labourer, according to this supposition, may be forced by his necessity to consume fewer articles, though he may exercise the same industry (1802, p. 239).

Thornton likewise alluded to the possibility of "a similar defalcation of the revenue of the unproductive members of the society," namely fixed-income recipients. Owing to these forced saving effects he concluded that "It has thus been admitted that paper possesses the faculty of enlarging the quantity of commodities by giving life to some new industry" (p. 239).

Nevertheless, he opposed pursuing these expansionary real effects because of the high inflationary costs of doing so. Indeed he condemned all forced saving and the accompanying price inflation as "attended with a proportionate hardship and injustice" (p. 239). To him, inflation was an unmitigated evil to be avoided at all costs, even if it meant giving up the associated gains in output and employment. These gains, he thought, could never compensate for the uncertainty, injustice, and social discontent generated by inflation. In short, he favored a policy of holding the money stock constant on the grounds that an accommodative policy's inflationary costs would far exceed its output and employment benefits.

Thornton Diagrammed

Thornton's analysis, like Ricardo's, can be depicted with aggregate demand and supply schedules (see Figure 2). Thornton's aggregate supply schedule, however, differs from Ricardo's. As noted above, Ricardo's supply schedule is vertical throughout its range, reflecting his assumption of complete wage-price flexibility such that changes in aggregate demand have no influence on output and employment.

By contrast, Thornton's supply schedule slopes upward to the point of full employment, reflecting his assumption that higher prices operating through wage lags and forced-saving effects induce higher levels of output and employment. In his own words:

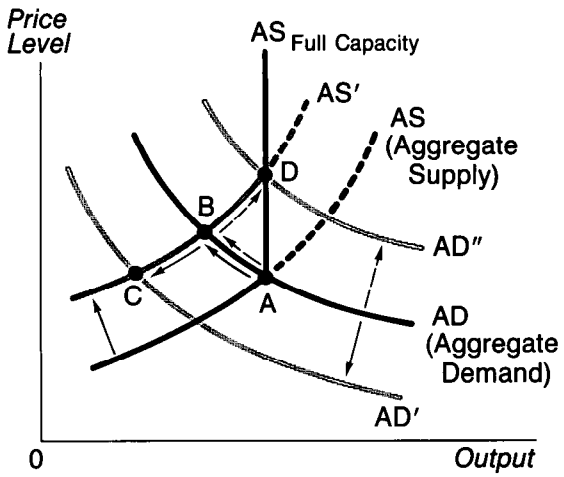
> . . . additional industry will be one effect of an extraordinary emission of paper, a rise in the cost of articles will be another.
>
> Probably no small part of that industry which is excited by new paper is produced through the very means of the enhancement of the cost of commodities (1802, p. 237).

In short, money-induced inflation stimulates output along the positively sloping portion of the supply schedule. Provided the economy operates in this range, output gains are possible. Only at the economy's absolute full-capacity level of output are these gains impossible to obtain. There Thornton's supply schedule becomes vertical (perfectly inelastic). At that point:

> . . . it is obvious, that the antecedently idle persons to whom we may suppose the new capital to give employ, are limited in number; and that, therefore, if the encreased [monetary] issue is indefinite, it will set to work labourers,

Figure 2

THORNTON'S ARGUMENT



Aggregate supply becomes perfectly inelastic at full employment. Point A denotes initial equilibrium. A harvest failure shifts the supply curve to the left. Equilibrium moves to point B with lower output and higher prices. Monetary contraction would shift the demand curve downward with equilibrium moving to point C. There prices would be stabilized at their pre-shock level at the cost of extra output losses. Alternatively, monetary expansion would shift the demand curve upward. Equilibrium would move to point D. There output would be stabilized at its pre-shock level at the cost of a further rise in price. To Thornton, the costs of monetary contraction and expansion rendered both actions unacceptable. His advice: Hold the money stock constant when supply shocks occur. Then rely on wage adjustment and/or self-reversal of the shocks to restore equilibrium to point A.

of whom a part will be drawn from other, and, perhaps, no less useful occupations. It may be inferred from this consideration, that there are some bounds to the benefit which is to be derived from an augmentation of paper; and, also, that a liberal, or, at most, a large encrease of it, will have all the advantageous effects of the most extravagant emission (1802, p. 236).

To summarize, for Thornton the classical neutrality-of-money proposition holds only at absolute full employment. Short of that point non-neutrality prevails. Note also that the positively sloped portion of Thornton's supply schedule is drawn for a given price of food and raw materials: rises in these particular prices shift the curve upward and to the left.

Thus starting from initial equilibrium at point A, suppose a harvest failure or other real shock shifts the supply schedule to the left thereby establishing a new equilibrium at point B with higher general prices and lower real output. Monetary contraction could, by shifting the aggregate demand curve down and to the left, restore prices to their pre-shock level at point C. But output would be depressed below its already low level produced by the shock. Because of this depressive effect, monetary contraction should be avoided.

Alternatively, monetary expansion could, by shifting the demand curve up and to the right, stabilize real output at its pre-shock level. But such output stabilization would involve a costly further price rise to point D. If the price rise generated additional uncertainty, injustice, and social discontent whose costs exceeded the benefits of output stabilization then accommodative policy should not be undertaken.

Since neither monetary contraction nor monetary expansion are desirable alternatives, it follows from Thornton's analysis that the money stock should be held constant in face of the shock. In the long run, equilibrium will in any case return to point A as the shock proves to be temporary and/or wages and prices fully adjust to clear the markets for labor and output. A policy of maintaining a constant money stock allows this self-equilibration process to occur naturally without intervention. It does not exacerbate the temporary price or output effects of the shock. True, it does not ameliorate these effects either. But they will be relatively small and short-lived if the wage-price adjustment mechanism works reasonably smoothly as Thornton thought it would.

Conclusion

The Ricardo-Thornton exchange taught that policymakers can respond to supply shocks either with monetary contraction, with accommodative monetary expansion, or with a constant money-stock policy. These alternatives define the set of feasible policy choices to this very day. Given their relevancy, which alternative should the Fed choose to counter the effects of any future oil shock?

Clearly it should respond with Ricardian monetary contraction if money affects only prices and not real output. Conversely it should respond with monetary expansion if money temporarily stimulates output and the resulting social benefits exceed the costs of higher prices. Lastly it should respond with Thornton's constant money-stock policy if the beneficial output effects of expansion would be exceeded by its inflationary costs.

Since, contrary to Ricardo's belief, money-stock changes always seem to entail temporary real output and employment effects,[5] the Fed's choice would probably narrow to Thornton's constant money-stock or accommodative policies. Of these, Thornton's policy appears to be the more prudent choice. Especially so as oil shocks may prove to be self-reversing and monetary accommodation today could generate expectations of similar accommodation in all future episodes contrary to the Fed's goal of achieving long-run price stability. These considerations strongly suggest the advisability of Thornton's neutral or constant money-stock response to supply shocks.

[5] In addition to the sources of non-neutrality identified by Thornton in his *Paper Credit*, such real effects may stem (1) from lags in nominal interest rates behind inflation so that real rates change, (2) from imperfect information and the resulting confusion of monetary shocks for relative price ones calling for real adjustments, and (3) from long-term contracts that prevent the private sector from responding to disturbances as quickly as the policymakers. Of these, Thornton mentions the first in his May 7, 1811 parliamentary speech on the Bullion Report (pp. 335-36).

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