

## Hayek's business cycle theory: "mistaken, but not crazy"

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"In standard histories (Chandler, 1973) or accounts of the Keynesian Revolution (Galbraith, 1965), the policy recommendations given by the liquidationists appear to be nothing but incoherent barbarisms that were, for some inexplicable reason, believed. Such an interpretation gets the history of economic thought wrong. It also creates a climate of undue smugness among the present generation of economists" ( J. Bradford DeLong 1990, 34)

### Introduction

Over the course of the last half-decade of depressed economic activity and subdued wage and price growth, nearly every economist's mind has been drawn at some point to the problems and personalities of the 1930s. Students of the Great Depression such as Ben Bernanke, Christina Romer, and Scott Sumner have risen to prominence, and Robert Skidelsky (2009) has heralded the "return of the master", John Maynard Keynes, as a source of guidance for economists (if not policymakers bent on austerity). But Keynes has not been the only posthumous beneficiary of the Great Recession. Although for decades most macroeconomists have considered Friedrich Hayek's work on the business cycle inconsequential, it has won a growing audience in recent years, thanks to political movements like the Tea Party, promotion through social media, and the embrace of charismatic politicians such as Representative Ron Paul. This degree of publicity for Hayek's ideas is hardly new. In the 1980s the endorsements of Ronald Reagan and Margaret Thatcher allowed Hayek to ride a fresh wave of conservative enthusiasm with the likes of Gordon Gecko and Ayn Rand. Before that, *Readers' Digest* popularized the arguments of his book *The Road to Serfdom* with an American public trying to make sense of the early days of the Cold War and the welfare state (see Hayek [1945] 2001 for the condensed Readers Digest version of the book).

However, this is the first time since the Great Depression that Hayek's business cycle theory<sup>2</sup> (as opposed to his broader philosophical perspectives) has registered at all in the public imagination, raising the obvious question: is there anything to the theory? The fact that most economists have dismissed it is not a trivial point, although it is possible that valuable Hayekian insights were overlooked in the rush to elaborate on advances made by Keynes in the *General Theory of Employment, Interest, and Money* (1936). This article takes a critical position on Hayek's business cycle theory, but one that is more nuanced than some of the blunt dismissals of Hayek in the 1930s and later years. I share J. Bradford DeLong's (1990, 33) view that "the advocates of the liquidationist [Austrian] point of view during the Great Depression were mistaken, but they were not crazy."

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<sup>2</sup> Hayek's ideas are occasionally referred to as "Austrian" throughout this article, but it is important to keep in mind that there were other Austrian commentators on the business cycle besides Hayek, principally Ludwig von Mises and Murray Rothbard, as well as various monetary disequilibrium theorists. These perspectives are in many ways comparable, but not always identical, to Hayek's (for example, Garrison (2004, 327) describes Mises's business cycle theory in *Human Action* (1966) as "largely compatible with Hayek's formulation but not obviously so"), but they are not considered here. Most discussions of "Austrian business cycle theory" seem to have Hayek's business cycle ideas in mind, but to avoid confusion I will refer here to Hayek's business cycle theory, leaving a broader review of Austrian macroeconomics in other, more capable hands.

The paper will begin with a summary of Hayek’s business cycle theory and the causes of the “unsustainable boom” and inevitable “upper turning point” preceding the bust. A brief discussion of the strengths and weaknesses of the major critiques of the theory will follow. The strongest critiques (Tullock 1987, Cowen 1997, Friedman 1993) are best thought of as empirical disconfirmations, which leads naturally into a review of the findings of a growing number of empirical investigations of Hayek’s business cycle theory, most of which have been conducted in the last decade. This empirical literature is still maturing in many ways, but it indicates that one of Hayek’s major suppositions about changes in the capital structure over the business cycle was likely correct. After discussing the empirical literature, I present evidence that the changes in the capital structure over the business cycle are not closely tied to loose credit conditions (as predicted by Hayek). This new empirical evidence analyzes the tightness or looseness of monetary policy by comparing interest rates to an estimate of natural rates, and not by looking at the absolute level of interest rates (as has been customary in much of the literature). I conclude with a discussion of a novel alternative interpretation of the evidence that finds a place for Hayek’s capital theory but only as an epiphenomenon in more traditional Keynesian explanations of the causes of the business cycle.

## **Hayekian business cycle theory**

### *The unsustainable boom*

To the uninitiated, Hayek’s macroeconomic dynamics are evocative of a Rube Goldberg contraption, a complex assortment of sequential price movements and mechanisms that are supposed to produce the phenomenon of the business cycle. But it is also possible to reduce the theory to its constituent parts without sacrificing any fundamental principles; an important contributor to its popular success in recent years. In its simplest form, Hayek’s business cycle theory can be thought of as a theory of two periods; the “unsustainable boom” and the “upper turning point”, when the boom turns into a bust.

Perhaps the best known statement on the business cycle by Hayek is the book *Prices and Production* (1931), which was based on lectures delivered at the London School of Economics and focuses primarily on the generation of an unsustainable boom. Modern graphical popularizations have elaborated principally on this book, and the historical drama around the lectures adds to its allure. Hayek argues that the boom begins with a credit expansion that is not derived from voluntary saving decisions made by households or firms. Although Austrians often draw attention to the monetary policy of central banks as the source of this credit expansion, those who are skeptical of fractional reserve banking especially are quick to add that it can also originate in the banking industry itself<sup>3</sup>. Central banks engage in credit expansion for a reason, of course: new supplies of credit lower the interest rate, which encourages additional borrowing by investors in anticipation of future profits. All economists recognize that there are risks associated with this sort of expansionary monetary policy that have to be carefully modeled and managed, such as inflationary pressures or asset bubbles. Inspired by older monetary traditions, Hayek pointed out that even if these problems remain subdued, growth induced by credit expansion may be unsustainable because the investors who respond to the expansion of credit are fundamentally different

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<sup>3</sup> See Block and Garschina (1996) for a review of the difference between Hayek and certain other Austrians on the question of the culpability of the banking industry in general. Garrison (2000) even discusses the prospect of fiscal policy or transfers initiating the credit expansion, although this is not a typical approach.

from the initial set of investors in the credit market before the policy change. The new investors are embarking on projects that were not feasible at the earlier, higher interest rates but are feasible after the central bank makes a credit injection that lowers rates. The character, and not just the volume, of investment is therefore affected.

For Hayek, the most important difference in the investments made after a credit expansion was that they would be investments in relatively longer production processes, with a greater delay between the commencement of the production process and the ultimate sale of the good. This is often referred to as a “lengthening of the capital structure”. Hayek reasoned that because production took place over an expanse of time, the optimal length of that production period would vary with the interest rate, either because credit was required for production to proceed (and a higher interest rate implied higher costs for longer processes than shorter processes), or because funds used for production had to compete with the return made possible by lending those funds at interest during the same amount of time<sup>4</sup>. Production processes that take a long time to earn returns have to take these carrying costs of capital into account when making investment decisions, and lower interest rates enable longer production periods than higher interest rates. Moreover, these changes to the capital structure under loose and tight credit conditions could be easily missed if capital is conceived as a more static factor of production that does not generate output over a period of time.

This lengthening of capital structure is significant because it is not compatible with society’s “time preference” in the absence of credit expansion. Hayek makes the familiar neoclassical assumption that the interest rate is determined in the market for loanable funds, and that the critical ingredient to the supply and demand of loans is time preference, or simply an agent’s *patience*. Households and firms supply loanable funds to borrowers when the interest rate meets or exceeds the value they assign to delaying the expenditure of those funds. Likewise, borrowers demand loanable funds if the discounted benefits they expect to enjoy from the use of those funds meet or exceed the interest costs that they pay. When credit is injected into the loanable funds market independent of these decisions by market participants (say, by a central bank), the interest rate is below its “natural” level. It is because the interest rate is artificially low that Austrians speak of artificial distortions in the capital structure.

Austrians cite the distortion of the capital structure as the primary reason why money is “non-neutral”, or why it has an impact on real decisions as opposed to simply changing the nominal price level (Subrick 2010, 115). Fritz Machlup said that, “the fundamental thesis of Hayek’s theory of the business cycle was that *monetary* factors *cause* the cycle but *real* phenomena *constitute* it” (Machlup 1974, 23). Hayek was not alone in asserting monetary non-neutrality, nor even in the minority. But most accounts of non-neutrality offer the prospect of an edifying monetary policy intervention (within the limits of human and institutional imperfection, of course). This is generally not the case for Austrians, who typically interpret central bankers (and in some cases, even private bankers operating under fractional reserve arrangements) as only contributing to the formation of another unsustainable boom. There is nothing especially redeeming about non-neutrality in Austrian macroeconomics.

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<sup>4</sup> In other words, the interest rate was either the cost of credit faced by the firm or it was the opportunity cost of funds already held by the firm. In both cases firms would be more willing engage in longer production processes if the interest rate were lower than if it were higher.

*The upper turning point*

The next step in Hayek’s business cycle theory was to explain exactly why the lengthening of the capital structure was unsustainable, or what would lead to the “upper turning point”. An early extended treatment of this question is provided by Hayek in *Profits, Interest, and Investment* ([1939] 1975), although the question was revisited in subsequent articles as well. According to Hayek, credit expansion would change spending behavior both by making production more capital intensive in general (bidding resources away from consumer goods producers), and lengthening production processes (so that proportionately more resources were used in early production stages). The resulting pressure on consumer goods prices facing workers would then lower the real wage, because the money earned by workers would purchase fewer consumer goods at the higher price level. Lower real wages would also entice producers to substitute away from capital intensive production and towards labor intensive production. The changes in production techniques resulting from credit expansion are therefore reversed by the correction of the distortions in relative prices that those changes set in motion. This rebalancing process was known as the Ricardo Effect, after the early work on the relationship between capital intensive production, consumer goods prices, and labor demand by the classical economist David Ricardo in the early nineteenth century.

O’Driscoll (1977) describes Hayek as being “delighted” by the paradox of a reduction in capital goods production that resulted from a scarcity of capital (i.e., from the *relative* abundance of more cost effective labor). Despite his apparent delight, in the late 1930s and for many years afterward, the Ricardo Effect explanation of the “upper turning point” in *Profits, Interest, and Investment* ([1939] 1975) proved to be far more contentious than the arguments about the lengthening of the capital structure in *Prices and Production* (1939). Kaldor (1942) noted that the fact that the rise in the real wage would end Hayek’s boom hardly demonstrates a crash would ensue. The rush toward capital intensive production would be *tempered* by the increasing competitiveness of labor intensive production until a new equilibrium was reached, but there was no reason to expect a crisis from this force<sup>5</sup>. The ability of the Ricardo Effect to explain how the unsustainable boom turns into a bust has been further questioned by Blaug (1968), Hagemann and Trautweinn (1998), and others.

Debates over the Ricardo Effect are of considerable interest in their own right, but this element of Hayek’s theory is generally de-emphasized in modern renditions of his business cycle theory. Modern expositors are typically content to note that the lengthening of the capital structure and the increased capital intensity of production is unsustainable because it is inconsistent with underlying time preferences<sup>6</sup>. Some fail to even cite the behavior of market actors or any endogenous process at all in their account of the upper turning point. For example, in their defense of Austrian business cycle theory against

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<sup>5</sup> Kaldor (1942) sums up his argument in this way: “However hard we try, we cannot construct a case where as a result of a rise in the rate of profit the capital intensity falls and as a result of this fall in capital intensity, investment expenditure will be less than it was before. To argue in this way involves the same fallacy as saying that because a rise in demand for a commodity will cause a rise in its price, and the rise in price causes a restriction in demand (because less is bought at a higher price than a lower price), the increase in demand will lead to a reduction in the amount bought.”

<sup>6</sup> Garrison (2000) describes the switch from boom to bust as a situation where “entrepreneurs encounter resource scarcities that are more constraining than was implied by the pattern of wages, prices, and interest rates that characterized the early phases of the boom” (p. 72). The capital structure is simply unsustainable because the price signals gave false information: there is no reference to pressure to switch away from capital-intensive production through a Ricardo Effect.

criticism from Laidler (2003), Block and Barnett (2007, 47) say only of the end of the unsustainable boom that “eventually the rate of increase of price inflation, let alone the price inflation itself, must come to an end, either through the crackup boom associated with hyperinflation, or by the government’s ceasing its unwarranted [i.e., not grounded in underlying time preferences] monetary policy”.

Although other Austrians have elaborated on how a recession could be expected to play out, Hayek’s business cycle theory was composed only of the unsustainable boom and the distortion of the capital structure, which was said to lead inevitably to a bust. It was easy to see how this mechanism could cycle repeatedly, if the central bank or the banking sector in general responded to each crisis with more easy money, but the theory did not necessitate a repeated cycle. Haberler (1986, 425-27), DeLong (1990), Callahan and Horwitz (2010) and others have noted that Hayek’s theory would not necessarily describe all recessions. The question of how relevant the theory is to modern recessions and how much heed macroeconomists should pay it is thus in many ways an empirical question. Nevertheless, a wide variety of theoretical assaults on Hayek were mounted before any substantial empirical assessment got underway.

### **The reaction to Hayek**

Hayek’s business cycle theory failed to make a lasting impression on macroeconomics. Paul Samuelson (2009) called Hayek’s work on these problems in the 1930s and early 1940s “a pebble thrown into the pool of economic science that seemingly left nary a ripple”. This is not to say that Hayek’s broader menu of ideas failed to have an impact on later macroeconomists, or that Hayek’s theory was not a valuable contribution to the discussion of business cycles that occurred during the 1930s. Both of these claims are true<sup>7</sup>. It is only to say that Hayek’s specific explanation of how business cycles occur barely got off the ground as a research program during the Great Depression and has not subsequently been taken seriously by most macroeconomists. Hayek and his co-Nobel laureate Gunnar Myrdal are conspicuously the only laureates cited by the prize committee for macroeconomic theory contributions who typically fail to make an appearance in the principal macroeconomic textbooks written for graduate students.

To a large extent Hayek’s lack of impact on macroeconomics is the result of the fierce initial criticisms he receive in the 1930s in response to the series of lectures he delivered at the London School of Economics and his subsequent book, *Prices and Production* (1931). A well known denunciation of Hayek’s work at the time was John Maynard Keynes’s 1931 characterization *Prices and Production* as “an extraordinary example of how, starting with a mistake, a remorseless logician can end up in Bedlam” (Keynes 1931, 394)<sup>8</sup>. Other critical responses to his lectures were met with evasiveness from Hayek, which of course did

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<sup>7</sup> For example, Lucas (1977) cites Hayek as a personal inspiration in thinking about business cycles as an equilibrium phenomenon. We have to trust Lucas to identify his own inspirations, but the parallel is not exact. Hayek is probably better thought of as offering a theory of how equilibrium forces generate a recession as a correction to a prior disequilibrium.

<sup>8</sup> Keynes’s discussion of Hayek’s book is often characterized as something of a cheap shot, because it actually appeared in a response to Hayek’s critical review of Keynes’s own *Treatise on Money*. Context is helpful in assessing the accusation. While the use of this opportunity to review Hayek was certainly unorthodox, Keynes discussed *Prices and Production* at length precisely because Hayek inserted his own theories into the original review of Keynes’s book, discussing Keynes as if he had been working adopted Hayek’s theories and ideas. Keynes cited and discussed *Prices and Production* in his reply to address this point, alleging that by starting down this road Hayek was “looking for trouble” (Keynes 1931, 388). Nevertheless, an unfortunate casualty of the preoccupation with the etiquette of Keynes’s reply is that people often ignore how substantive his discussion of *Prices and*

not ingratiate him to his audience. Richard Kahn, a Cambridge economist and colleague of Keynes, recalled Hayek’s lecture this way:

“Usually a Marshall Society talk is followed by a lively and protracted barrage of discussions and questions. On this occasion there was complete silence. I felt that I had to break the ice. So I got up and asked, ‘Is it your view that if I went out tomorrow and bought a new overcoat, that would increase unemployment?’ ‘Yes,’ said Hayek. ‘But,’ pointing to his triangles on the board, ‘it would take a very long mathematical argument to explain why.’” (Kahn quoted in Ebenstein 2003, 53)

The “triangles on the board” was a reference to a common diagrammatic exposition of the distortion of the capital structure, which has been expanded upon by Garrison (2000) and others. This dodge was especially ironic, considering that Austrian economics is usually associated with the rejection of mathematical formalization in economics, in favor of a more literary (and *allegedly* more intuitive) style (see, for example, the discussion of math and Austrian economics in Boettke 1994, 605). In the early 1930s, the critics felt that Hayek had furnished them with neither the math nor the intuition for the theory he presented. After getting past their initial incredulity, more substantive critiques of Hayek began to trickle in, meeting varying degrees of success.

#### *Interest rates and distortions*

Hayek’s early work in the United Kingdom was primarily concerned with the unsustainable boom, leaving detailed discussions of the upper turning point to later books and articles. Naturally some of the first criticisms were directed at this part of the theory. One of the most prominent detractors was Piero Sraffa, a Cambridge economist that was asked by Keynes (in his capacity as editor of the *Economic Journal*) to respond to Hayek. Sraffa (1932) pointed out that if the economy was not in equilibrium (as Hayek suggested it would not be) there could be no single natural rate of interest, so it was difficult to see how Hayek’s concern with distortions caused by an interest rate pushed below the natural rate were intelligible. Sraffa showed that given a certain basket of consumer goods as an index for consumer prices, you could calculate one natural rate, but with a different basket you would get a completely different natural rate, because each good has its own rate of interest<sup>9</sup>. Without any “correct” natural rate of interest it was hard to see how a unique capital structure could be considered *the* sustainable or natural capital structure.

Sraffa was right to dismiss the idealized version of the natural rate of interest used by Hayek, but the problems posed for Hayekian business cycle theory by this point are relatively trivial. Conrad (1959) and Lachmann ([1956] 1978) showed that the solution to the puzzle was that multiple natural rates of interest could emerge if the economy was in equilibrium at a particular point in time, *but not* in intertemporal equilibrium. Lachmann also points out that Sraffa ignores liquidity differences and differences in real

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*Production* was. One of the most important elements of the reply was one of the earliest direct criticisms from Keynes of the naïve loanable funds theory of the interest rate. These criticisms would later bloom into his watershed book, *The General Theory of Employment, Interest, and Money* (1936).

<sup>9</sup> This is because each good trades for different amounts of future versions of itself: an interest rate is simply how much of itself a dollar will trade for at some time in the future.

costs (like storage costs), which help to explain observed variability of own rates of interest. Murphy (2010), an Austrian economist, considers Sraffa's criticism more substantial and Hayek's concept of a natural rate unintelligible. Murphy (2010) agrees with the general thrust of Conrad (1959) and Lachmann's ([1956] 1978) solution that in an intertemporal equilibrium we can say that a credit expansion is distortionary, but he maintains that even in this situation discussion of a "natural rate" is unintelligible. Although his is one of the more famous critiques of Hayekian business cycle theory, Sraffa is better thought of as presenting an argument against casual discussions about a single natural rate than a threat to the main contours of the theory.

A more substantial rebuttal to Hayek's concerns about a distorted capital structure is offered by Tullock (1987), who objects to the whole idea that firms care much about interest rates in determining the volume of production. Hayek's theory requires that an artificially low interest rate makes production that takes a longer time more profitable than it otherwise would be, but if interest costs are not even considered by firms the whole theory falls apart. Tullock (1987, 75) observes:

“...the interest rate is of great significance in deciding whether or not to build a new factory, buy an expensive machine, etc., but of very little significance in deciding how much to produce in an existing factory. In my own experience as a member of the board of directors of a small company, we frequently discuss interest rates at great length when we are considering capital expenditures. I cannot recall the interest rate even being mentioned in any of our discussions of production matters.” (Tullock 1987, 75).

He further noted that the reason why firms ignore interest rates in production decisions is that even highly capital intensive production processes (after all capital equipment has been acquired and installed) do not usually take a substantial amount of time to complete. Tullock's experience with interest rates anticipates a finding by Akerlof, Dickens, and Perry (2000) that as long as inflation is modest, firms ignore it in their decision making. Although entrepreneurial responses to interest rate variations (in Tullock's case) or low inflation (in Akerlof, Dickens, and Perry's case) need not be identical, the common conclusion of this and other behavioral research seems to be that these sorts of minor costs are discounted in the decision making process relative to larger concerns. If interest rates and inflation fail to drive distortionary production decisions it is hard to see why a market correction would be inevitable or even necessary. Interest rates are still critical for large capital expenditures, but the widely cited empirical work of Davis, Haltiwanger, and Schuh (1996) suggests that most job creation and destruction happens at large, mature establishments which are presumably primarily making capacity utilization decisions rather than new capital expenditure decisions.

### *Expectations*

A popular but ultimately unsatisfying critique of Hayek concerns the question of entrepreneurial expectations. If the average central banker is sharp enough to come up with the idea of lowering the interest rate to expand the economy, and the average Austrian economist is sharp enough to deduce the inevitable consequences of this policy, it seems appropriate to expect that the average entrepreneur should be able to foresee the unsustainability of the boom as well, at least on average. So why are they fooled into building an unsustainable, distorted capital structure in the first place? Although John Hicks (1967)

made this point early on the criticism became particularly acute after the rational expectations revolution, which made entrepreneurial expectations the centerpiece of investigations of the efficacy of both monetary and fiscal policy. The best known modern version of this argument against Hayek is offered by Cowen (1997), who advocates building rational expectations assumptions into a “New Austrian” theory.

One approach to answering Hicks and Cowen is to point out that even rational entrepreneurs cannot afford to pass up a subsidy. If a crash will ensue regardless as a result of the actions of your peers, why suffer through the recession *and* miss out on the boom? This is a solid response, but a more straightforward problem with the expectations critique is simply that a purist view of rational expectations is entirely implausible. This is not a response restricted to Austrians or their heterodox counterparts on the left: it is a thoroughly mainstream viewpoint<sup>10</sup>. It would be untenable to argue that human beings are *incapable* of forming fairly accurate expectations about the future. The best expectations formers naturally turn out to be some of the better entrepreneurs, who Keynes credited with piercing through the “dark forces of time and ignorance that envelope our future” (Keynes 1936, 155). But it is equally untenable to suggest that humans can never be fooled or that their expectation formation is instantaneous. A decade before the financial crisis and shortly after Cowen’s (1997) book was published, Rosser (1999, 386) wrote in the pages of this journal about all that needs to be said in response to the expectations critique of Hayek: “it is profoundly ironic that just as some of the most influential advocates of rational expectations are moving in the direction of Mises and Hayek as well as Keynes, Cowen is rushing in the opposite direction and defending this movement by labeling it ‘New’”.

The kernel of truth in the expectations critique is that it is unacceptable at this stage in the game to neglect modeling expectations (regardless of their degree of “rationality”). Although Hayek was clearly aware of the importance of expectations in the 1930s (see, for example, Hayek 1937), this awareness does not inform his business cycle theory as it is traditionally rendered.

### *Fitting the data*

If Cowen’s (1997) expectations critique is weak, he offers a far more substantial case against the predictions of Hayekian business cycle theory. Cowen (1997) points out that over the business cycle, investment and consumption move together, a phenomenon he refers to as “co-movement”. For at least two reasons, Hayek’s theory predicts that investment and consumption should move in opposite directions over the business cycle, with investment increasing in the boom and decreasing in the bust. First, *Prices and Production* assumed that the economy starts in a position of full employment before the unsustainable boom begins. Cowen notes that since the economy is operating at capacity any increase in capital goods production has to come at the expense of consumer goods production. The second reason for the expected differential behavior of investment and consumption concerns the upper-turning point, which accounts for the end of the boom with the Ricardian assumption that capital intensification occurs *at the expense* of labor income, and that this tension between capital and labor ends the boom.

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<sup>10</sup> It probably is not entirely fair to say that anyone ever really “believed” rational expectations. Rather, it was a modeling convention that helped to highlight the impact of rationality in expectations, even if that rationality was only partial. Indeed, Cowen (2000) indicates that this is his own view in his reply to Rosser (1999). Of course, this has not prevented some economists from continuing to make arguments that implicitly depend on a stronger version of rational expectations.

Austrians have answered this criticism in at least two ways. Sechrest (1998) offers what can be thought of as a demand-side response that the growth in capital intensive production raises the incomes of capital goods producers, who then engage in more consumption. Garrison (2000, 2004) provides a supply-side response by assuming that capital intensive production processes are more productive than labor intensive production processes, so the move to capital intensive processes can accommodate a simultaneous increase in consumption and investment. Garrison's answer to Cowen is stronger than Sechrest's as it actually provides a mechanism for a growing economic pie that affords both consumers and investors a bigger slice. However, it is not Hayek's answer<sup>11</sup>. Hayek clearly expected a movement of consumption and investment in opposite directions: "an increase in the demand for consumer goods will tend to decrease rather than increase the demand for investment goods" (Hayek [1939]1975, 3). More importantly, if Garrison's correction of Hayek is accurate, it is not clear what needs to be rebalanced in a market correction (i.e., a recession). Recall that the upper turning point occurred *precisely because of this tension between consumption and investment*. If that tension is explained away by Garrison then it would seem that the inevitable bust is explained away as well. A business cycle theory without a bust is not a business cycle theory at all; it is a growth theory!

Another cutting critique grounded in an assessment of how well Hayek's theory fits the data is Milton Friedman's (1969, 1993) "plucking model" of the business cycle. Friedman was interested in justifying a monetarist explanation of recessions and wanted to establish that recessions came from monetary mischief, and not booms that came to an end. He cited Mises (and by association, Hayek) as an example of a theory of recessions that originate in boom. We would expect that if the conditions of the set the stage for the bust, then the depth of the bust ought to be proportional to the height of the *prior* boom, or at the very least the amplitude of the cycle should be random. A correlation between the depth of a recession and the height of the *subsequent* boom would strongly imply that recessions are the consequence of a shock that had nothing to do with the preceding growth period, and that the recovery was just a reversion of the economy back to its stable growth path. Friedman found that in a data series going back to the late nineteenth century recession depths were correlated with the subsequent boom and not the prior boom. He called this the "plucking model" because it implied that recessions were caused by plucking the economy down from an otherwise steady growth path. In many ways, Friedman's simple empirical exercise offers the greatest blow to Hayek of all the criticisms discussed here. A theory of the unsustainable boom is of little use if busts are not caused by booms<sup>12</sup>.

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<sup>11</sup> There are ways to patch up these inconsistencies between Hayek and Garrison. You could assume that Garrison's unsustainable growth comes through consuming existing capital equipment or neglecting capital maintenance. But this poses further problems. On an empirical level, expenditures on capital maintenance are known to grow during the boom. But aside from that, capital consumption and the neglect of capital maintenance would *weaken economic growth*. The prospect of stronger growth was the whole point of Garrison's argument. Salvaging Garrison's response to Cowen by invoking capital consumption or the neglect of capital maintenance is simply robbing Peter to pay Paul. Presumably other patches are available, but none of them offer the clarity or parsimony of Cowen's critique.

<sup>12</sup> Not surprisingly, Garrison (2000) has responded to Friedman as well (222-224 and 235-243). But he only seems able to claim that the plucking model does not disprove Hayek's business cycle theory so much as it suggests that the capital structure remains undistorted by monetary fluctuations over the business cycle. This seems to me to be a distinction without a difference. I also find Garrison's (2000) counterintuitive explanation of why *the Keynesian model* is contradicted by Friedman completely unintelligible. Readers are therefore encouraged to assess Garrison's

The criticisms of Hayek’s business cycle theory presented in this section are only a sampling of some important instances, offered with a conscious intention of presenting cases where Hayek’s theory performs well relative to its critics, and where it performs poorly. Other notable detractors include Wagner (1999), DeLong (1990), Harbeler (1986), Yaeger (1986), and Hummel (1979). Roger Garrison is easily the most comprehensive respondent to these critics on behalf Hayek, particularly in his book *Time and Money* (2000), as well as a career spanning set of excellent articles, which I will have to refrain from listing here.

Generally speaking, Hayek seems to stand the strongest against purely theoretical critiques. Sraffa’s concerns only really obligate Austrians to avoid talking carelessly about natural rates of interest<sup>13</sup> (and few besides the odd Sraffian or Post-Keynesian are bound to call them out on it anyway). The long-standing criticism of Hayek’s treatment of entrepreneurial expectations itself appears relatively retrograde in light of recent work on departures from rational expectations. More serious problems emerge with the critiques that bleed into questions of empirical verification (e.g., Tullock, Cowen on the co-movement of investment and consumption, and Friedman). Austrians have answered these authors, but their defenses of Hayek give the same impression to modern readers that the early attempts to salvage *Prices and Production* gave Kaldor (1942), that “when one attempted to fill these gaps, they became larger, instead of smaller”. Since the empirically flavored criticisms seem to be the most cogent, a sensible next step is to take a closer look at the empirical literature on Hayekian business cycle theory, to see if Hayek withstands even further scrutiny.

### **Empirical evaluations of Hayekian business cycle theory**

Efforts to empirically defend Hayek’s business cycle theory are often underappreciated, by Austrians as well as their critics. This literature is not large, but it makes considerable progress in evaluating the validity of Hayek’s theory. One way to organize these studies is to distinguish between what could be called “reduced form” and “structural” analyses. Reduced form studies test for macroeconomic outcomes that are predicted by Hayekian business cycle theory without investigating whether Hayek’s theory of why those outcomes are predicted is true. In contrast, structural studies explicitly model the Hayekian mechanisms driving the business cycle (i.e., the lengthening of the capital structure) to test whether these mechanisms behave according to expectations. A summary of twenty selected empirical evaluations of Hayekian business cycle theory are provided in Figure 1. The studies are divided into reduced form and structural analyses. The variables used by the authors to characterize credit conditions, the capital structure, and the business cycle are each summarized in their own column. In many cases, multiple variables were used for these purposes (for example, Keeler (2001) uses both the slope of the yield curve and the money supply to characterize credit conditions). A proper survey of this literature is beyond the scope of this article, but the following discussion should provide an organized guide to the typical approaches, and a sense of their strengths, weaknesses, and the most notable findings.

#### *Reduced form analyses*

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response to Friedman themselves. Although I generally find his book to be helpful, I unfortunately appear to be an inadequate guide to Garrison’s discussion of these issues.

<sup>13</sup> An obligation I will personally ignore in the interest of exposition below, with the only defense being that I am not constructing a formal model.

Several of the studies that have been done can be characterized as “reduced form” in the sense that they test whether headline macroeconomic variables such as GDP, investment, or the yield curve behave in a manner predicted by theory, without trying to model the mechanism underlying this behavior. This approach is limited. Macroeconomic theories typically do not survive long in the marketplace of ideas if they fail to explain basic business cycle facts, so unless they are carefully justified, reduced form analyses are typically considered less helpful than “structural” analyses that do model causal mechanisms. Admittedly, the line separating a reduced form analysis from a structural one is blurry, and the divisions imposed here are by no means immutable<sup>14</sup>.

Reduced form investigations of Hayekian business cycle theory naturally highlight the relationship between credit conditions and various macroeconomic aggregates such as output (Carilli and Dempster (2008), Bismans and Mougeot (2009) and Hoffmann (2010)), stock market indices (Callahan and Garrison (2003) and Schnabl and Hoffmann (2008)), or the components of national income (Mulligan (2005), and Bismans and Mougeot (2009)). In the case of output measures and stock market indices, the expectation is that expansionary credit conditions will generate a boom, followed by a bust. Since this line of approach does not attempt to demonstrate whether Austrian *processes* are important, these studies typically identify themselves with Austrian economics by motivating their analyses with a Hayekian theoretical discussion or by invoking Hayek to interpret the patterns in the data. Such an exercise is valuable for placing Austrian theories in the context of well-known macroeconomic regularities, but it is obviously limited in the degree of confirmation that it can offer.

Although the specifications of the reduced form studies are all somewhat different, their results are comfortingly familiar. Reduced interest rates, increased loans, or larger term spreads are associated with growing investment and output, and for those studies comparing investment to consumption, investment accelerates more robustly than consumption (Mulligan (2005)). These are fine results, but their only connection to Hayek is that Hayek (along with every other observant macroeconomist) expected to see these results. Carilli and Dempster (2008) and Hoffmann (2010) provide more intriguing evidence that in the U.S. and most East European economies, the economic growth associated with reduced interest rates is followed in later months by a decline in output. Of course they consider this suggestive of an unsustainable boom coming to an end. The problem is that *even if* monetary policy was unnecessarily expansionary in these cases, no one doubts that low interest rates encourage investment and that the withdrawal of those rates (perhaps as a result of the realization that policy was too easy) will put downward pressure on investment. There is no obvious reason to attribute this to Hayekian distortions. Additionally, the size of the relationship between interest rates and the lagged reduction in output is quite small in Carilli and Dempster (2008), despite its statistical significance<sup>15</sup>.

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<sup>14</sup> For example, in Figure 1 Mulligan (2005) and Bismans and Mougeot (2009) are classified as “reduced form” even though they justify investigating differentials between capital and consumer goods expenditures and prices on Hayekian grounds. Although Hayekians place a special emphasis on these variables, they are not unique to the Hayekian model. In contrast, studies looking at different stages of production or production periods are designated as “structural” because they are investigating a uniquely Hayekian construct. These are, admittedly, judgment calls.

<sup>15</sup> Young (2011) argues that reporting statistical significance without considering whether results are meaningfully large is a pervasive problem in the literature on Hayekian business cycle theory. I tend to agree with him.

Callahan and Garrison (2003) and Schnabl and Hoffmann (2008) are distinctive in that their research interests (the dot-com boom and bubbles in emerging markets) lead them to test for the impact of interest rates on stock market indices. They both report the not particularly surprising finding that low interest rates are associated with asset market booms. Although they cite Hayek and the credit-induced boom extensively, these studies depart most notably from the canonical version of the theory theory in their focus on the response of financial markets to credit injections and the lack of an attempt to estimate the lengthening of the capital structure that is the centerpiece of other investigations.

The reduced form studies exhibit a range of variables chosen to capture the phenomenon of a credit injection. In addition to natural choices like the volume of commercial and industrial loans or the federal funds rate, two more creative (although differentially advisable) approaches are used. Bismans and Mougeot (2009) along with several of the structural analyses use the term spread, or the difference between short term and long term interest rates, as a measure of easy credit. This choice is grounded in the assumption that long term interest rates represent the “natural rate” so that in equilibrium short term rates would be equal to long term rates. By this logic, the fact that short term rates are normally lower than long term rates is supposed to indicate a credit expansion. The problem with this is that it ignores the liquidity premium: even in equilibrium we expect long term rates to be higher than short term rates because the future is less certain. Lenders require a premium to convince them to part with their liquid funds during progressively more uncertain future periods. Even to the extent that the natural rate of interest informs the level of long term interest rates, changes in this term spread are as likely to reflect changing levels of uncertainty and liquidity preference as they are to indicate loose money.

On the other end of the spectrum, a much stronger variable for credit conditions is used by Carilli and Dempster (2008) and Hoffmann (2010). They use various estimates of the natural rate of interest derived from the long run growth rate of the economy to determine the gap between actual interest rates and the natural interest rate. This is much more consistent with Hayek’s understanding of the ultimate causes of the unsustainable boom and is preferable to using the term spread or even the actual interest rate<sup>16</sup>.

### *Structural analyses*

The overarching problem with even the stronger reduced form articles is that they have no way of anchoring the relationship between credit conditions and the business cycle to Hayek’s ideas about distortions of the capital structure. This effort has been undertaken using one of three general strategies. First, authors have classified industrial sectors into early and later stages of the production process. For example, extraction industries such as mining are classified as early production stages while retail and wholesale represent later stages. This is the approach taken by most structural analyses for the obvious reason that these data are easily available. Seven studies that use this approach are provided in figure 1, below. The problem with assigning industrial sectors to Hayek’s production stages is that official industrial classifications were not designed for this purpose. A firm’s industry is defined by the sorts of products that it primarily produces for final sale, not by the activities that are conducted by the firm. For example, a large manufacturing company is likely to internally provide its own human resources and management services, engineering services, transportation, and in the heyday of the vertically integrated

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<sup>16</sup> This point will be discussed in more detail in the next section.

firm, perhaps even raw material extraction. Each of these activities has its own industrial classification, but the value added from that activity could very well be counted as “manufacturing” if it is done internally. Andrew Young (2011, 27) describes another problem with independently assigning industries to Hayekian production stages:

“Is “mining” an early stage? How long did it take to create the mining equipment? If some of the equipment was produced in, say, the “manufacturing” industry, is manufacturing an earlier stage? More disconcerting, if the “finance, insurance, and real estate” industry financed the mining industries purchase of equipment from manufacturing, is finance, insurance, and real estate the earliest stage of them all?”

His point is that one industry’s output is likely to contribute to multiple stages of the production process. Results derived from studies that make these arbitrary sectoral divisions are the most dubious of all attempts to model the capital structure, although they may be able to serve as a robustness check for more sophisticated approaches, to ensure that the results are not sensitive to how the capital structure is operationalized. Most of these studies do find a capital structure that lengthens when credit is looser and shorten when credit is tighter.

It is critical for the consumer of the empirical literature on Hayek’s business cycle theory to understand that these investigators are fighting a frustrating uphill battle simply to get intelligible results. The modern public statistical infrastructure is designed around the needs of Keynesian economists of the 1940s and 1950s. There is nothing nefarious about this; indeed most economists would agree that the budgets of the agencies that produce these economic statistics are resources well spent. But it does make modeling Hayekian concepts more difficult.

A second, stronger, approach utilizing readily available data is to track price or capacity utilization changes for different stages of the production process. Examples of stage of process studies include Keeler (2001), who works with capacity utilization, and Lester and Wolff (2012), who look at prices for crude, intermediate, and late stage producer goods. Unlike industrial classifications, which define a *firm’s* primary (although not necessarily their only) activity, stage of process classifications are associated with *goods*. For example, if a firm that is classified as being in the manufacturing industry purchases a raw material for \$100, processes it into a semi-finished good that would sell on the market for \$125, and then further processes and sells a finished product to a retailer for \$150, those prices will be assigned to earlier and later stage of process price indices, even though all of them are associated with the activities of a manufacturing firm. Stage of process data are therefore much better at characterizing the capital structure as Hayek perceived it.

The evidence from stage of process studies is mixed. Keeler (2001), who uses capacity utilization data, finds that a steeper yield curve (which he somewhat dubiously interprets to indicate loose monetary policy) is associated with higher capacity utilization in earlier stages than later stages of production, consistent with Hayek’s expectations. Lester and Wolff (2012) use price data for goods at each of these stages and conclude that there is no relationship between unanticipated changes in the federal funds rate and relative prices. They find that semi-finished and primary production goods (the two intermediate stages) increase the most in response to an unexpected reduction in the interest rate, finished good prices

respond with a somewhat lower price increase and crude good prices register almost no increase. Hayekian theory suggests that crude prices should increase the most, due to increased investment in longer production processes<sup>17</sup>.

The most sophisticated empirical research on Hayekian business cycle theory to date is offered by Andrew Young (2012), who develops a measure of the length of the capital structure rather than relying on qualitative industrial or process classifications. He estimates the position of an industry in the capital structure with the total industry output requirement (TIOR), or the gross value of all other industries' output required by an industry to generate one dollar's worth of that industry's final good. Industries that fall relatively early in the capital structure will use fewer inputs to produce their (gross) output, and so they will have a lower measured TIOR. Using this method, Young (2012) calculates the TIOR for sixty-five industries, and determines that the aggregated length of the capital structure measured using his methods is pro-cyclical and closely correlated with the federal funds rate from 1998 to 2009, as Hayekian theory suggests. One problem with this measure that Young (2012) points out is that it's not clear how much meaning can be ascribed to a given change in the TIOR. From 2008 to 2009, the aggregate TIOR fell from about 1.8 to a little over 1.7. Is this a large change or a small change? Does it matter for macroeconomic fluctuations? At this point, it is difficult to say.

If nothing else, the empirical work suggests that Kaldor (1942, 363) is quite wrong in dismissing the lengthening of the structure of production as “one of those blind alleys of economic speculation which appear very suggestive for a time, but whose significance evaporates as soon as one tries to fit the theoretical conclusions more closely to the observed phenomena”. The theoretical discussion fits the best analyses of the observed phenomena quite well. Questions remain as to the strength of the Hayekian mechanisms or their significance for the business cycle. Despite these intriguing findings, the empirical literature on Hayekian business cycle theory is nevertheless small and mostly restricted to Austrian venues (and therefore somewhat sheltered from non-Austrian criticisms)<sup>18</sup>. Much of it is unpersuasive. However, a spate of papers on the subject by doctoral students offers hope that in the future a stronger empirical literature will be built on the foundation that is summarized above. Research by five of these doctoral students is reviewed below.

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<sup>17</sup> Keeler's (2001) use of capacity utilization for the dependent variable is also not ideal. If investment in a production process increases, capacity utilization may stay exactly the same if utilization of the new production capacity increases at the same rate.

<sup>18</sup> A notable exception is Young (2005), which was published in *Economic Letters*.

**Figure 1:** Selected Empirical Studies of Hayekian Business Cycle Theory

	<b>Credit condition variable</b>	<b>Capital structure variable</b>	<b>Business cycle variable</b>
<b>Reduced form analyses</b>			
Callahan and Garrison (2003)	Federal funds rate	--	NASDAQ Composite
Mulligan (2005)	Commercial and industrial loans	Investment and consumption spending	--
Mulligan (2006)	Term spread	--	Real consumable output
Carilli and Dempster (2008)	Gap between natural and actual interest rates	--	Log real GDP
Schnabl and Hoffmann (2008)	Interest rates	--	National stock market indices
Bismans and Mougeot (2009)	Term spread	Price and expenditure ratios for consumption and investment	Real GDP gap
Hoffmann (2010)	Gap between natural and actual interest rates	--	Industrial production
<b>Structural: classification of sectors</b>			
Wainhouse (1984)	Commercial and industrial loans, interest rates	Price ratios for a variety of earlier and later producer and consumer goods	Sectoral output
Butos (1993)	Total reserves, commercial bank loans, interest rates	Production, capacity utilization, and employment ratios for durable and non-durable manufacturing	--
Hughes (1997)	Money supply growth	Bank loans by sector	--
Mulligan (2002)	Interest rates	Sectoral employment	--
Powell (2002)	Money supply, discount rate	Sectoral output	GDP growth, unemployment
le Roux and Ismail (2004)	Term spread, short term interest rates, money supply	Capacity utilization ratio for heavy and light industries	Real GDP growth
Young (2005)	Federal funds rate	Sectoral job reallocation	--

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Cachanosky (2012)*	Exchange rate regime	Price ratio for traded and non-traded sector	--
Whittle (2012)*	Term spread, money supply	Sectoral employment	--
<b>Structural: stage of process</b>			
Keeler (2001)	Term spread, money supply	Capacity utilization ratio for primary and advanced processing	Real GDP gap
Lester and Wolff (2012)*	Unanticipated changes in the federal funds rate	Price ratios for four production stages	--
<b>Structural: estimation of period of production</b>			
Weber (2009)*	--	Classification of sectors and estimate of average roundaboutness	--
Young (2012)	Federal funds rate	Total industry output requirement	--

Notes: \* indicates a paper authored by a doctoral student

### *Empirical doctoral research*

A common exercise in the literature on the scientific workforce is to evaluate the “pipeline” of researchers, to see if a sufficient supply of scientists is making its way through the academy to support a research agenda in the future. Although the number of students interested in Austrian economics is inevitably small, several doctoral students are currently doing empirical work on Hayekian business cycle theory. Since only a handful of established Austrian economists do empirical business cycle theory work, this suggests that the outlook for robust growth in this area is quite positive.

Cameron Weber, a doctoral student at the New School for Social Research, develops an aggregate measure of the length of the capital structure, much like Young (2012), using a weighted sum of production stages that he assigns to various industrial sectors. This approach is similar to many other studies, but Weber’s (2009) unique contribution is to look at changes in the capital structure over the long run, rather than over the business cycle. He finds, as Austrian capital theorists would suspect, that long run growth in the United States has been associated with capital structure lengthening. Other doctoral work is equally innovative in its approach to Hayek. Nicolas Cochanasky (2012), of Suffolk University, explores the differential impact of a credit expansion on the capital structure of tradable and non-tradable goods in a small open economy. Open economy considerations are fundamental to assessing the ultimate impact of national economic policies and forces, but they have been relatively neglected by Hayekian business cycle theorists. Cochanasky (2012) therefore offers a bridge between Austrian macroeconomics as it is practiced and a vibrant element of the mainstream literature. Robert Lester and Jonathan Wolff, both doctoral students at the University of Notre Dame, are co-authors of the structural analysis using stage of process data discussed above (Lester and Wolff 2012), which is one of the few studies that fails to find evidence in favor of Hayek. Finally, Richard Whittle (2012) of the Manchester Metropolitan University Business School, adopts the stage of process measure approach to modeling the capital structure used by Keeler (2001) to test the behavior of the British capital structure in response to variations in credit conditions.

The students discussed here have published articles, presented papers, or have job market papers that are easily accessible. Only Cochanasky has published his findings at this point. Presumably, many more doctoral students who have yet to propose their dissertations as of the writing of this article will also contribute to this literature in the future.

### **The stance of monetary policy**

Many authors of empirical studies of Hayekian business cycle theory have assumed that a relatively low interest rate implies loose monetary policy. This is a sin of commission; monetary policy may be tight under low interest rates or loose under high interest rates, depending on the value of the natural rate of interest. Others are content with setting aside the question of the monetary policy stance entirely by restricting analysis to the behavior of the capital structure over the business cycle or in response to credit conditions regardless of whether they are “loose” or “tight”. This is a sin of omission but surely a forgivable one, given the difficulties posed by even that restricted research question.

Ultimately, though, identifying the stance of monetary policy is critical for assessing the usefulness of Hayekian business cycle theory, even if it is firmly established that the length of the capital structure is pro-cyclical<sup>19</sup>. Even a stripped down version of Hayek’s business cycle theory, jettisoning all of the Rube Goldberg mechanisms, has *at least* two steps:

- (1.) Loose credit conditions → Artificially lengthened capital structure
- (2.) Artificially lengthened capital structure → End of the boom

Young (2012) and others offer credible evidence that the capital structure lengthens during the boom and shortens during the bust. But if the stance of monetary policy is not also pro-cyclical, it is doubtful whether the mechanisms described by Hayek are critical for macroeconomists to consider<sup>20</sup>.

The stance of monetary policy can be thought of as loose if the real federal funds rate is below the real natural rate of interest, and tight if it is above the real natural rate. Overall credit conditions will determine the length of the capital structure, which may fluctuate with time preference even when monetary policy is entirely neutral. But the stance of monetary policy – its relative tightness or looseness – is what is critical for generating an *unsustainable* lengthening of the capital structure. Determining the real value of federal funds rate is trivial, but identifying the “natural rate of interest” is not as straightforward. The best estimates available are provided by Laubach and Williams (2003, and periodically updated) who use data on inflation and output to determine the interest rate consistent with stable prices and the economy operating at its full potential. Figure 2, below, subtracts the real federal funds rate from this estimated natural rate. If this difference is equal to zero, then the actual federal funds rate set by the Federal Reserve is equal to the best estimate of the natural rate of interest, and monetary policy is neutral. A positive value for the difference indicates tight monetary policy, while a negative value indicates loose monetary policy. Vertical lines are provided to indicate the start date of recessions, as determined by the National Bureau of Economic Research.

It is difficult to conclude from the estimates of the monetary stance in Figure 2 that Hayek’s sequence of loose money, followed by the elongation of the capital structure, and an upper turning point ending in recession is the dominant experience for most of the post-war period. From 1965 until the late 1970s, monetary policy is persistently expansionary, through boom and bust alike. Money becomes tighter than it had been at previously the commencement of the 1969 and the 1973 recessions, which (given the error implicit in estimating the natural rate) may confirm Hayek’s theory. However, the monetary stance never actually tightens in this period, nor does it even stay neutral for long. If Hayek is correct this should still be a period of unprecedented accumulation malinvestments and capital intensification, because the brief return of interest rates to their neutral position in the late 1960s and mid-1970s was immediately abandoned for continued loose monetary policy. This would imply a build-up of tension between the distorted capital structure and the true time preference of the population, leading to the endogenous emergence of a major recessionary episode. Although a large recession did occur in 1980, it is widely

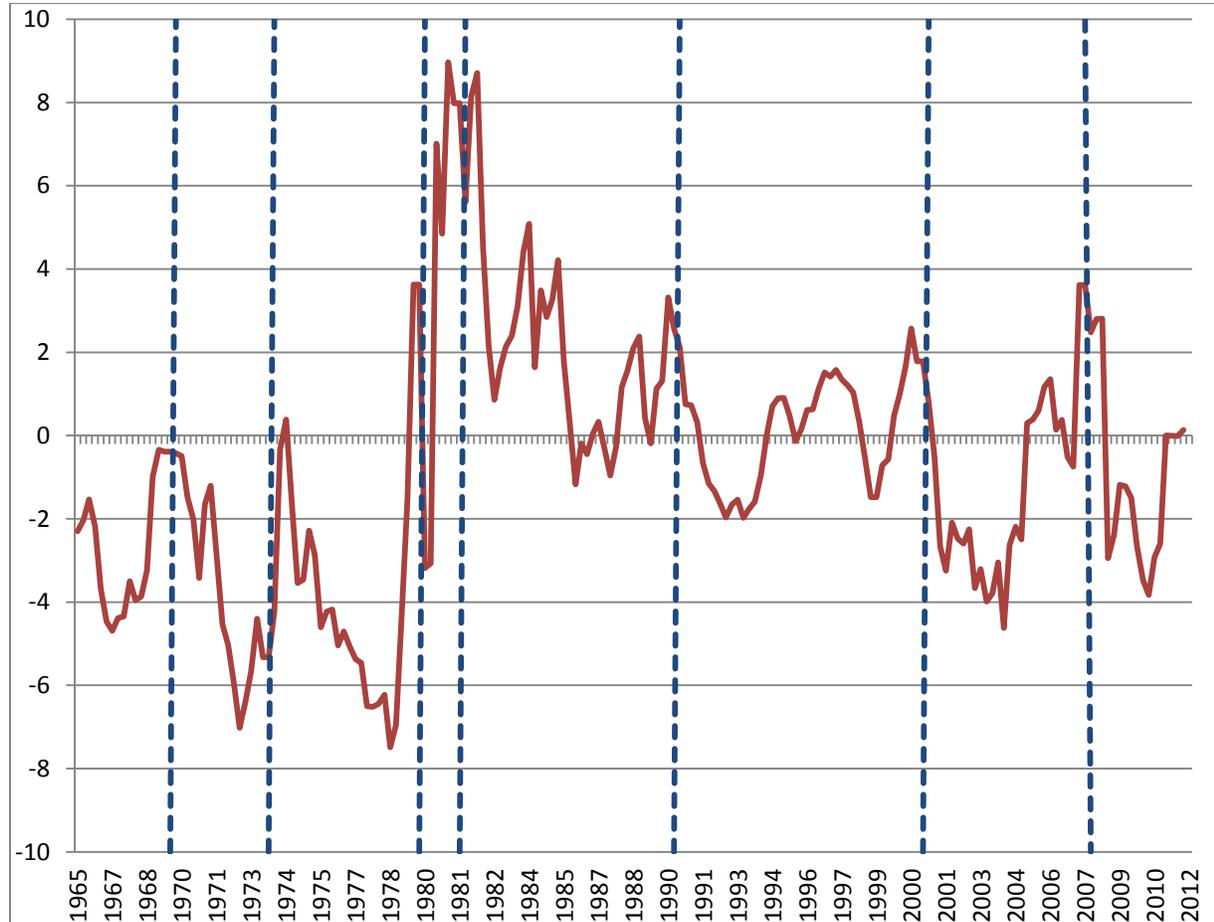
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<sup>19</sup> My view is that the evidence to date does indicate the likely pro-cyclicity of the length of capital structure, but that these results are still highly preliminary.

<sup>20</sup> Despite the advances in econometrically operationalizing the capital structure to my knowledge only Carilli and Dempster (2008), who are discussed above, have bothered to explore whether the monetary policy stance conforms to Hayek’s theory. But these authors fail to consider the capital structure at all and while some of their results are statistically significant, they do not suggest a meaningfully large effect of loose monetary policy on output.

acknowledged that this downturn was deliberately (i.e., exogenously) caused by Paul Volcker at the Federal Reserve, and that it was not the result of any endogenous tendencies in the economy. Volcker orchestrated the recession to end the inflation of the 1970s, which is particularly awkward for Hayekians since the reduction of real wages by price inflation was supposed to be the source of the upper turning point and the end to the boom. After fifteen years of expansionary monetary policy, these endogenous forces were clearly not up to the task that Hayek had assigned to them; the task that Volcker accomplished.

**Figure 2: The monetary policy stance**



**Source:** Author's calculations from Laubach and Williams (2012), the National Bureau of Economic Research (2012), and the Federal Reserve Bank of St. Louis FEDFUNDS data series.

The recessions of the 1960s and 1970s at least have the virtue of exhibiting the pro-cyclical (albeit persistently loose) monetary stance required by Hayek. Far less is available for Austrians to work with in the case of the 1981-82 and 1990-91 recessions, which were not preceded by any monetary loosening at all. Regardless of the actual level of the real interest rate, if this rate is not *below the natural rate* – if monetary policy is not expansionary – there can be no unsustainable boom according to Hayekian business cycle theory. The capital structure may change in response to the real interest rate, but the unsustainability of these changes is contingent on loose monetary policy.

In the most recent recession, monetary policy returns to the natural rate of interest in late 2005, several years before the crisis. Laubach and Williams's estimates of the natural rate are admittedly imprecise, but estimates of the Taylor rule concur that monetary policy ceased being loose a few years before the financial crisis of 2008 (Taylor 2009). Hayekians who think that the capital structure lengthens and contracts with the price signals sent by monetary policy are confronted with an awkward question: *exactly what were entrepreneurs doing* between 2005-06 and 2008? The distortion in the price signal communicated by the interest rate had already been revealed. There was nothing preventing the capital structure from adjusting back to what was dictated by time preference in a recessionary event. Rather than being wracked by a rebalancing of the capital structure and the abandonment of unprofitable investments in 2006, the global economy was shaken by panic over a particular class of financial assets in 2008. These are two quite different stories of the onset of the Great Recession.

If Hayek offered a reasonable characterization of the business cycle we would expect to see a loose monetary stance before recessions that returns to its natural rate *and is maintained at the natural rate* during recessions. This does not appear to characterize the recessions of the post-war period, including the Great Recession. Many empirical analyses of Hayek's theory have established that some plausible proxy for the length of the capital structure moves with the interest rate in the way that Hayek predicted. However, it is critical to distinguish between a change in the interest rate itself and a change in the stance of monetary policy (loose or tight). Low interest rates do not always indicate loose monetary policy if they are consistent with time preferences. Hayek's theory requires a loose monetary stance to generate the business cycle and an unsustainable boom, not *any* instance of low interest rates.

### **An alternative interpretation of the significance of Hayekian theory**

To illustrate the importance of the link between the central bank's departure from the natural rate of interest and the validity of Hayekian business cycle theory in interpreting the empirical literature, consider a hypothetical case where Hayekians are exactly right about the behavior of the capital structure, but the relationship between the interest rate and the business cycle is more Keynesian. A Keynesian view of the interest rate would suggest that recessions occur when some shock to entrepreneurial expectations (perhaps a financial crisis) causes a flight to liquidity. Demand for *both* capital and consumer goods are reduced so that households and firms can stay liquid. Following this shock a lower interest rate is required to convince potential lenders to part with liquidity and demand goods and services than was required before the shock, so that any given interest rate indicates a *tighter* monetary stance than it would have indicated in more normal times. In this hypothetical case, we would expect to observe:

1. During non-recessionary periods, a certain length of the capital structure would be maintained, consistent with time preferences.
2. When a recession hits, the flight to liquidity lowers the natural rate of interest that is consistent with full employment and stable inflation (i.e., the monetary stance tightens).
3. The tighter monetary stance makes the capital structure of the full employment economy unprofitable, and entrepreneurs are incentivized by the tighter monetary stance to *shorten* the capital structure.

In other words, we would observe the same pro-cyclicality in the length of the capital structure identified by Young (2012) and others, even though the capital structure plays absolutely no role in bringing on

recessions. In this case, however, the “natural” length of the capital structure is the relatively elongated capital structure of the full employment economy. The unnatural, distorted capital structure is the shorter capital structure of the recession, when the flight to liquidity drives interest rates higher than time preferences would indicate. This demonstrates that a pro-cyclical capital structure on its own is not proof of Hayekian business cycle theory: an entirely different business cycle theory, combined with Hayek’s understanding of capital theory, will generate the same data.

The most defensible attitude towards the critics of Hayekian business cycle theory is one of sympathy and affirmation, but these critics are often too quick to dismiss the whole project of Hayek’s early work (i.e., up to and including *The Pure Theory of Capital* (1941)). Hayek’s arguments about the capital structure were eminently logical and entirely consistent with mainstream economic analyses of relative prices. It is no wonder that the empirical literature seems to find evidence for longer capital structures during the boom. The critics need to be more open to these insights, and pivot their discussions away from the question of whether Hayek has adequately theorized the capital structure and toward the question of whether Hayek was attending to the correct phase of the business cycle. Another way of putting this point is to say that the relative length of the capital structure in growth years and the relative shortness of the capital structure in recessions does not mean that it is *too long* during growth years and *just right* during the recession (as Hayek theorized). It may be the case that it is *just right* during growth years and *too short* during the recession.

The empirical literature reviewed above is frustrating insofar as it does nothing to clarify whether Hayek’s interpretation of the capital structure is correct or whether the alternative interpretation that I provide here is correct. Keynesianism’s ability to explain other facts of the Great Recession, such as the unusual behavior of inflation and interest rates (see Krugman (2012) for details), suggests that my alternative interpretation may have merit, and that while Hayek had important insights into capital theory, the profession has correctly declared his business cycle theory unconvincing.

Integrating a Hayekian capital theory with Keynesian macroeconomics should be easier than one might suppose. Both men ultimately derived their understanding of capital theory from William Stanley Jevons. Hayek inherited Jevons through the work of the Austrian economist Eugen Bohm-Bawerk, and Keynes inherited him through the English economist Alfred Marshall. Bohm-Bawerk and Hayek highlighted Jevons’s emphasis on the fact that the production of goods is not instantaneous; it takes place over time. Keynes was also concerned with the fact that capital goods were used over time, but he drew attention to expectations about the stream of future returns that would be earned from a piece of capital. We could say that Hayek thought about the “intensive” temporal structure of capital – how temporally intensive a given production process is, while Keynes thought about the “extensive” temporal structure of capital – the way that the returns to capital extended into future periods. Both emphasized the relationship between time and capital heterogeneity, and the impediments they imposed to smooth macroeconomic adjustments. Keynes and Hayek are also both deeply concerned with entrepreneurial expectations.

The most substantial obstacles to integrating Hayekian capital theory and Keynesian macroeconomics is likely to be differences of opinion on the determination of the interest rate, with Keynesians insisting (particularly since entering a liquidity trap) on a role for liquidity preference. Aside from these technical difficulties, Keynesians and Hayekians simply conceive of interest rates in different ways. Both are

dedicated to the idea that the interest rate communicates valuable price signals, but Keynesians worry about the interest rate acting as a limiting and even distortionary influence on investment during recessions. Hayekians, in contrast, are concerned that interest rates will present the opposite problem by being pressed to low during booms. In addition to being two different economic theories, these are two fundamentally different mindsets that seem to resist reconciliation. For Hayekians, the unsustainable boom and the concept of the capital structure appear to be inextricably linked, although there is no necessary reason for this.

## **Conclusion**

For a long time, Hayek's business cycle theory has been ignored by most economists. This diversion away from Hayek is not entirely unjustified, but a consequence has been that more has been lost from Hayek by the mainstream than is really necessary. It is not lost, of course, in the community of Austrian economists and interested historians of economic thought that continue to debate Hayek's theory and have recently commenced testing it empirically. The limited empirical literature indicates that Hayek was right about the dilation of the capital structure in response to changing credit conditions, a finding that should be of interest to mainstream and Austrian economists alike.

Attempts to link findings on the capital structure to the business cycle have been considerably less satisfying, and have largely ignored (or improperly operationalized) Hayek's view that a loose monetary stance (and not simply low interest rates) are required to make a boom *unsustainable*. The relationship between loose money and subsequent busts in the post-war United States is quite weak, though. As Friedman (1969, 1993) pointed out using other methods many years ago, there is a much stronger link between busts that are independently caused by tight money (and not by a preceding boom). In light of the weak evidence for Hayek's unsustainable boom, it seems far more plausible that Keynesian (or monetarist) forces drive the business cycle, and that the capital structure – behaving in an otherwise purely Hayekian manner – lengthens and contracts as a consequence of the business cycle, rather than as its cause. As always more research is required to confirm this interpretation, but in light of the repeated failure of Hayekian business cycle theory to clear the hurdles it is presented with, the suggestions offered here seem to be worth the effort of further exploration.

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