KEYNES AND FRACTIONAL RESERVE BANKING: THE NPV VS. MEC

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Abstract: This paper develops a framework for the economic analysis of fractional reserve banking. After introducing the loan market theory and the net present value, the paper shows how fractional reserve banking causes the business cycle by systematically falsifying net present value rankings. Next, the paper demonstrates that Keynes's IS-LM model and marginal efficiency of capital rule out fractional reserve banking as the cause of the business cycle. Finally, the paper shows that Keynes's theory is fundamentally flawed because his theory of investment in incorrect.

Keywords: Fractional reserve banking, Austrian business cycle theory, John Maynard Keynes, Keynesian economics, net present value, marginal efficiency of capital.

JEL Classification: E12, E22, E32, E43, E51, E58, G30.

Resumen: Este trabajo desarrolla un marco para el análisis económico de la banca con reserva fraccionaria. Después de presentar la teoría del mercado de préstamos y el valor presente neto, el documento muestra cómo la banca con reserva fraccionaria causa el ciclo económico al falsificar sistemáticamente las clasificaciones del valor presente neto. A continuación, el documento demuestra que el modelo IS-LM de Keynes y la eficiencia marginal del capital descartan la banca con reserva fraccionaria como la causa del ciclo económico. Finalmente, el artículo muestra que la teoría de Keynes es fundamentalmente defectuosa dado que su teoría de la inversión es incorrecta.

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Palabras clave: Banca con reserva fraccionaria, teoría austriaca del ciclo económico, John M. Keynes, economía keynesiana, valor actual neto, eficiencia marginal del capital.

Clasificación JEL: E12, E22, E32, E43, E51, E58, G30.

> «A sound doctrine can win only by exploding the delusions of its adversaries».
>
> Ludwig von Mises

I
INTRODUCTION

Many critics of John Maynard Keynes attribute the success of his ideas to political appeal. No doubt, politicians are attracted to Keynesian economics because it can be used to justify profligate government spending. While important, political appeal alone cannot totally explain his triumph. Since Keynes's theory is purportedly an economic theory, it could have never prevailed without the economists. So why does Keynes's theory attract so many economists, and the most influential economists in particular? The answer is that influential economists in the banking system are attracted to Keynesian economics because it can serve as an economic justification for fractional reserve banking. The Keynesian interpretation of fractional reserve banking is an important reason Keynes's theory conquered the economics profession.

Economists were becoming increasingly critical of fractional reserve banking in the years before Keynes published his theory. Even Alfred Marshall, the founder of the Cambridge school of economics, argued fractional reserve banking amplifies the business cycle (Marshall 1879, 150-57). In 1912, Ludwig von Mises showed that fractional reserve banking is the fundamental cause of the business cycle (1912, 396-404). The Great Depression led many eminent American economists, including Irving Fisher, Frank Knight, Henry Simons, and Jacob Viner, to advocate abolishing fractional

reserve banking. In fact, it was the American backlash against fractional reserves in the early 1930s that led directly to the formation of the Chicago school of economics (Emmett 2002, ix). During the Great Depression, Senator Bronson Cutting and other politicians in the United States introduced legislation to abolish fractional reserve banking (Phillips 1992).

Keynes's theory was a godsend for the defenders of fractional reserves. Pre-Keynesian economics showed fractional reserve banking causes the business cycle and thereby makes society poorer than it otherwise would be. Before *The General Theory of Employment, Interest and Money* (1936), the defenders of fractional reserve banking had no answer to the pre-Keynesian analysis. But Keynes gave defenders of fractional reserves a weapon with which to combat the pre-Keynesian analysis. While the pre-Keynesian theory shows fractional reserve banking destroys wealth, the seemingly scientific New Economics purports to show that it is good for the economy. Rather than impoverishing society, fractional reserve banking actually creates prosperity in Keynes's system. In short, Keynes transformed fractional reserve bankers from economic villains who cause depressions into economic heroes who enrich society.[1] It is no wonder so many influential economists in the banking system have enthusiastically adopted Keynes's theory.

The purpose of this paper is to show how Keynesian economics represents a justification for fractional reserve banking and why this justification is fundamentally flawed. In contrast to other examinations of Keynes's theory, this paper will highlight the marginal efficiency of capital. Like Ludwig von Mises, Keynes was a financial economist who gave economic calculation a central role in his theory. But Mises and Keynes adopted different approaches to economic calculation: Mises used the net present value and Keynes used the marginal efficiency of capital. Importantly,

[1] It is worth noting that Keynes became a director of the Bank of England on September 18, 1941. At the Bretton Woods conference in 1944, Keynes refused to endorse Irving Fisher's 100 percent reserve plan and he was responsible for preventing the liquidation of the Bank for International Settlements (Keynes 1944). He was appointed British governor of the World Bank on February 19, 1946.

Keynes argued that the marginal efficiency of capital and the net present value yield identical results. Keynes was wrong: the marginal efficiency of capital contradicts the net present value, and, therefore, it is a logically defective approach to economic calculation. Consequently, Keynesian economics is not a viable justification for fractional reserve banking.

II
THE LOAN MARKET AND FRACTIONAL RESERVE BANKING

Important aspects of the pre-Keynesian theory and the Keynesian theory can be illustrated with the loan-market framework. Ludwig von Mises, Friedrich Hayek, and Murray N. Rothbard used the loan market to analyze fractional reserve banking.[2] Also, the loan-market diagram is the only diagram in *The General Theory* (CW 7, 180). This makes the loan market the natural starting point for any comparison of the pre-Keynesian and Keynesian interpretations of banking.

According to the loan-market theory, the interest rate is determined in the loan market by the supply and demand for loans. The interest rate is the price of a loan, and, just like all other prices, the interest rate is determined by supply and demand. Hence, the loan-market theory holds that the price of a loan—the interest rate—is determined by the supply and demand for loans.[3] Now, in a totally private economy with 100 percent reserve banking, the

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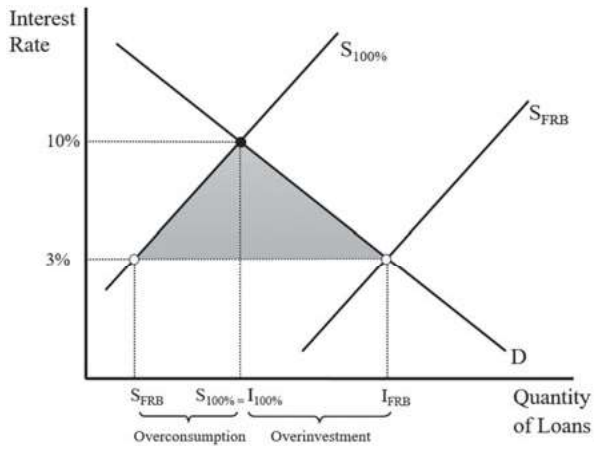
[2] Murray N. Rothbard (1962, 420-26) criticized the loanable-funds framework, but Mises, Hayek, and Rothbard himself used the loan market to explain the economic effects of fractional reserve banking. See Mises (1912, 307, 344, 388-401; 1928, 107; 1933a, 188; 1946, 194, 200; 1949, 524, 535, 544-50, 568, 579), Hayek (1931, 218, 264-65; 1941, 57, 324-25), and Rothbard (1963, 10, 77, 80; 1969, 83; 1973, 224, 233-34).

[3] A loan means «present goods are exchanged for future goods,» and the interest rate is the «price of present goods in relation to future goods» (Huerta de Soto 1998, 19, 285). Thus, the interest rate is the price of a loan. Moreover, the loan market is the time market used by Rothbard (1962, 388) if every exchange of present goods for future goods is included in the loan market. The only exception here is that consumer loans net out because the saving by the saver is offset by the consumption of the borrower. This means the loan-market framework excludes consumer loans (Garrison 2001, 36-37; 2005, 489). Otherwise, the loan market used here is the entire time market.

supply of loans equals saving and the demand for loans equals investment. Therefore, in the loan-market theory, the interest rate is the price that adjusts to bring saving and investment into equilibrium.

Figure 1 is the loan-market diagram. The supply curve, S100%, represents the supply of loans (saving) in an economy with 100 percent reserve banking. The demand curve, D, represents the demand for loans (investment). In an economy with 100 percent reserve banking, the equilibrium interest rate equalizes the amount of saving and the amount of investment. In figure 1, the x-axis shows the amount of saving equals the amount of investment, S100% = I100%, when the interest rate is 10%. Thus, 10% is the equilibrium interest rate.

FIGURE 1
THE LOAN MARKET WITH 100%
AND FRACTIONAL RESERVE BANKING



Savers are the only source of loans in an economy with 100 percent reserve banking. Importantly, however, an economy with a fractional reserve banking system has two sources of loans: savers and fractional reserve banks. According to the theory of multiple

deposit creation, fractional reserve banks increase the supply of loans by creating new money out of thin air. To demonstrate, imagine that the money multiplier is ten and the central bank makes a $100 open-market purchase. The central bank initiates the process of multiple deposit creation by injecting new reserves into the banking system. T-account 1 shows how multiple deposit creation affects the banking system's balance sheet. The left-hand side of T-account 1 shows that the supply of loans increases by $1,000. The right-hand side of T-account 1 shows that the $1,000 increase in the supply of loans is matched by an increase in the money supply (deposits) of $1,000.[4] In short, fractional reserve banking causes an increase in the supply of loans and an increase in the money supply.[5]

Banking system			
Assets		*Liabilities & Equity*	
Securities	–100	Deposits	+1,000
Reserves	+100		
Loans	+1,000		

T-account 1: Multiple deposit creation.

T-account 1 illustrates an important point: in addition to savers, banks are a source of loans in an economy with fractional reserve banking. This means the supply of loans is always greater under fractional reserve banking than under 100 percent reserve banking. In figure 1, the supply of loans with fractional reserve banking

[4] This paper focuses on the increase in the supply of loans on the left-hand side of the balance sheet. However, the increase in the money supply (deposits) on the right-hand side is also important. The right-hand side of the balance sheet shows that fractional reserve banking is inflationary. Thus, fractional reserve banking «exert[s] harmful effects on almost all third-party participants throughout the economic system» (Huerta de Soto 1998, 709).

[5] On multiple deposit creation, see Abel and Bernanke (2005, 523-26), Huerta de Soto (1998, 217-31), Krugman and Wells (2006, 730-32), Mankiw (2007, 510-15), Mishkin (2004, 366-71), and Rothbard (1983, 161-76).

is represented by the supply curve SFRB. Fractional reserve banking adds to the supply of loans from savers, so SFRB equals S100% plus the amount of loans from fractional reserve banks. Notice that SFRB is located to the right of S100%. This indicates that the supply of loans with fractional reserve banking is always greater than the supply of loans with 100 percent reserve banking.

The equilibrium interest rate under 100 percent reserve banking equalizes saving and investment. By contrast, fractional reserve banking prevents the interest rate from adjusting to bring saving and investment into equilibrium. The greater supply of loans under fractional reserve banking artificially reduces the interest rate below the equilibrium (natural) interest rate established under 100 percent banking. In figure 1, fractional reserve banking artificially reduces the interest rate to 3%. An artificially low interest rate necessarily affects the amount of saving and investment. First, the x-axis shows that fractional reserve banking crowds out saving so that the amount of saving falls from S100% to SFRB. Since people save less by consuming more, the amount of consumption rises. The distance between SFRB and S100% is called overconsumption. Second, the x-axis shows that fractional reserve banking increases the amount of investment from I100% to IFRB. The distance between I100% and IFRB is called overinvestment. In summary, the loan-market framework shows that fractional reserve banking artificially reduces the interest rate and thereby causes overconsumption and overinvestment.[6]

III
DISCOUNTED CASH FLOW ANALYSIS

Discounted cash flow analysis is the most important concept in finance. According to the theory of discounted cash flow (DCF)

[6] Figure 1 shows that fractional reserve banking suspends Say's law: «The entire Austrian theory of the economic cycle merely explains why, under certain circumstances, and as a consequence of credit expansion, Say's law repetitively fails to hold true» (Huerta de Soto 1998, 545, 580). On figure 1, see Garrison (1996; 2001, 36-40; 2005, 489-92).

analysis, the price of an investment project tends to equal the present value of the project's future cash flows. The present value of an investment project is completely dependent on three factors: (1) the size of the future cash flows, (2) the timing of the future cash flows, and (3) the interest rate. An example is the easiest way to illustrate the present value, and the classic guide to Keynes's economics uses the following example: «Consider the case of a [wooden bridge] costing $2,000 whose life is only three years and which offers the prospect of a series of yields of $1,000 in each of three years» (Hansen 1953, 118). The size of the cash flows is $1,000 and the timing of the cash flows is one cash flow each year for three years. Figure 1 shows the equilibrium interest is 10%. If the cash flows are discounted at the 10% interest rate, then the present value (PV) of the wooden bridge is $2,486.85.

TABLE 1
NPV OF WOODEN BRIDGE AT 10% INTEREST RATE

Time	*Cash Flow*	*Discounted Cash flow*
0	–2,000	–2,000
1	1,000	909.09
2	1,000	826.45
3	1,000	751.31
Present value (PV)		2,486.85
Net present value (NPV)		486.85
Marginal efficiency of capital (MEC)		23.38%

Investors make investment decisions by comparing the price of the investment to the present value. A project's net present value (NPV) equals the present value minus the price of the investment. As Mises wrote, the NPV is «the difference between the price paid … and its present value» (1952a, 156).[7] The NPV of the wooden

[7] Eugen von Böhm-Bawerk, Ludwig von Mises, and Murray N. Rothbard are the leading Austrian exponents of the NPV approach. The modern theoretical idea of the

bridge equals the present value ($2,486.85) minus the price ($2,000). The NPV of the wooden bridge is $486.85.

The basic NPV criterion holds that investors accept positive NPV projects and reject negative NPV projects. The NPV is a direct estimate of profit, and it shows how much an investor's wealth is expected to change by investing in the project. A project with a positive NPV is expected to increase wealth by the amount of the NPV, but a project with a negative NPV is expected to reduce wealth by the amount of the NPV. In the example above, the investor will invest in the wooden bridge because it is expected to increase wealth by $486.85. Since investors seek to enhance wealth, the basic NPV criterion states that investors must only invest in projects with positive NPVs.

Many economists have failed to recognize that the basic NPV criterion is incomplete. The basic NPV criterion alone does not give investors a rule for ranking mutually exclusive projects. In an advanced economy, there are almost always many different ways to produce the same good. Almost every investment project will have mutually exclusive alternatives because there are always short-term and long-term methods of production: «The alternatives constantly presented to most business men are between policies which may be distinguished as temporary and permanent» (Fisher 1907, 192).[8] Investors must only invest in projects with positive NPVs, but the essential decision facing investors is short-term or long-term investment.

The example above can be extended to illustrate the importance of short-term versus long-term investment. There are many different ways to build a bridge, so imagine the investor above can use steel instead of wood to build a more durable bridge. Table 2 is the

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NPV was originated by Eugen von Böhm-Bawerk and Alfred Marshall. But Irving Fisher deserves special recognition for his enormous contributions to the development of the NPV. On the origins of the NPV, see Böhm-Bawerk (1891, 304, 339-57; 1903, 35n1), Fetter (1904, 121; 1915, 235-313, 275n1), Fisher (1907, 25, 140, 148-64, 175, 190, 290, 409), and Marshall (1890, 516). See Rothbard (1962, 62-63, 297, 489) for a modern Austrian exposition of the NPV.

[8] On the importance of mutually exclusive projects, see Mises (1922, 123; 1933b, 142-43; 1949, 694-95, 926), Hayek (1941, 80, 89-90, 160-61) and Huerta de Soto (1998, 560-61).

cash flow profile of the steel bridge, and it shows the steel bridge is a relatively long-term investment project. The annual cash flows are the same size as the wooden bridge, but the steel bridge is more durable so it generates cash flows further into the future. Specifically, the steel bridge will generate a cash flow of $1,000 per year in years three through ten. The present value of the steel bridge is $4,409.03 when the interest rate is 10%. The price of the steel bridge is $5,000, so the NPV is –$590.97.

TABLE 2
NPV OF STEEL BRIDGE AT 10% INTEREST RATE

Time	*Cash Flow*	*Discounted Cash Flow*
0	–5,000	–5,000
1	0	0
2	0	0
3	1,000	751.31
4	1,000	683.01
5	1,000	620.92
6	1,000	564.47
7	1,000	513.16
8	1,000	466.51
9	1,000	424.10
10	1,000	385.54
Present value (PV)		4,409.03
Net present value (NPV)		–590.97
Marginal efficiency of capital (MEC)		7.74%

Wealth-maximizing investors use the NPV to rank competing investment projects. Beyond the basic NPV criterion, the NPV rule asserts that investors select the investment project with the highest positive NPV: «[The investor] chooses that investment in which he

expects to make the highest possible profit» (Mises 1949, 806, 243, 332-33, 336; Rothbard 1962, 350, 634, 750). The investor selects the project with the highest NPV because that is the project that maximizes wealth. Table 1 shows the NPV of the wooden bridge is $486.85, and table 2 shows the NPV of the steel bridge is –$590.97. According to the NPV rule, the investor will invest in the wooden bridge over the steel bridge because it has a higher NPV.

The interest rate plays an absolutely essential role in the NPV framework. All else equal, there is a negative relationship between the NPV and the interest rate. To demonstrate, table 3 is a NPV schedule, and it shows the NPV of each project at different interest rates. Table 3 shows that, all else equal, the NPV of an investment project increases as the interest rate falls.

TABLE 3
NPV SCHEDULE

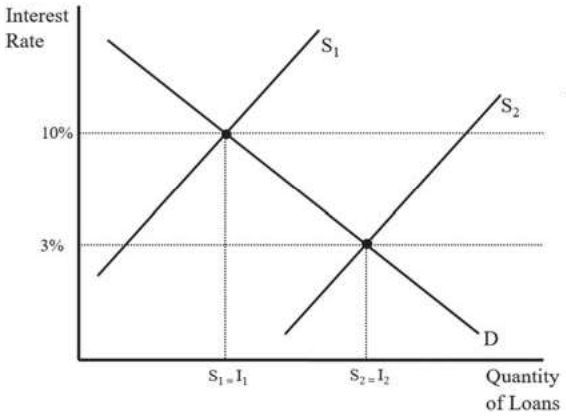
Interest Rate	*Wooden Bridge*	*Steel Bridge*
1%	940.99	2,500.91
3%	828.61	1,616.73
4%	775.09	1,224.80
5%	723.25	862.32
5.48%	699.10	699.10
6%	673.01	526.69
7%	624.32	215.56
7.74%	589.26	0.00
8%	577.10	–73.18
9%	531.29	–341.45
10%	486.85	–590.97
23.38%	0.00	–2,713.02

Importantly, NPV rankings depend on the interest rate. The wealth-maximizing investment decision changes depending on

the interest rate. Table 3 shows that the wooden bridge has a higher NPV if the interest rate is above 5.48%, but the steel bridge has a higher NPV if the interest rate is below 5.48%.[9] Table 3 illustrates a central feature of the NPV: the interest rate plays a key role in determining which projects are selected by investors.

The NPV shows that the interest rate regulates the intertemporal allocation of resources. In other words, the interest rate tells investors whether consumers prefer short-term or long-term investment projects. To illustrate, figure 2 combines the 100 percent reserve loan-market diagram and the NPV schedule. It shows that if the interest rate is 10%, then the investor allocates resources to the wooden bridge because it has a higher NPV ranking.

FIGURE 2
100% RESERVE BANKING AND THE NPV



NPV Schedule

Interest Rate	Wooden Bridge	Steel Bridge
10%	**486.85**	-590.97
5.48%	699.10	699.10
3%	828.61	**1,616.73**
1%	940.99	2,500.91

Increased saving is the only way to increase the supply of loans in an economy with 100 percent reserve banking. Increased saving means there has been a change in the time pattern of consumption:

[9] In this example, 5.48% is called the crossover rate. It is the discount rate at which both projects' NPVs are equal. Irving Fisher calls the crossover rate the «rate of return over cost» (1930, 155).

consumers want less current consumption and more future consumption. In figure 2, an increase in saving shifts the supply of loans curve right, from S1 to S2. The increased saving reduces the interest rate, from 10% to 3%. Significantly, the NPV schedule in figure 1 shows that an increase in saving changes NPV rankings. After the increase in saving, the steel bridge has a higher NPV ranking than the wooden bridge. A drop in the interest rate adjusts investors' NPV rankings to reflect that consumers want to wait for the future output of long-term projects. The NPV shows the interest rate coordinates the time pattern of investment with the time pattern of consumption. In short, a lower interest rate tells an investor, via NPV rankings, that consumers prefer longer-term projects: «A low rate favors the choice of "capitalistic" methods of production» (Fisher 1907, 196).

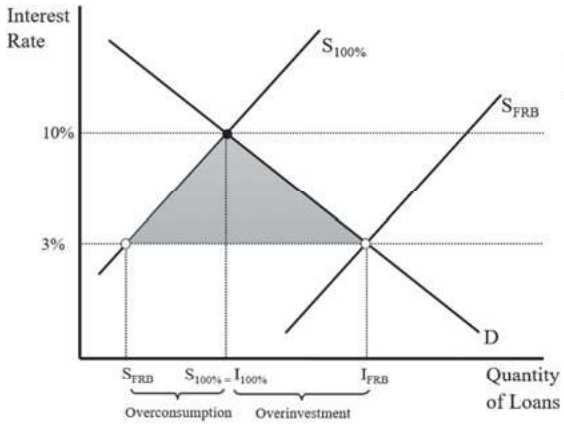
Figure 2 illustrates that the interest rate communicates changes in consumers' saving habits to investors through NPV rankings. Although figure 2 only shows the NPV rankings of a single investor, a lower interest rate has a similar effect on every investor's NPV rankings. The interest rate is the universal NPV input. The interest rate is the price that enters all NPV calculations, so a change in the interest rate affects all NPV rankings. By reducing the interest rate, an increase in saving systematically changes NPV rankings across the entire economy so that investors allocate resources to longer-term investment projects. The NPV illustrates that the interest rate determines the time pattern of investment.

According to the Austrian business cycle theory, fractional reserve banking is the cause of the business cycle. To demonstrate, figure 3 introduces fractional reserve banking into the loan market. Fractional reserve banking causes the interest rate to fall, from 10% to 3%. Figure 3 shows that fractional reserve banking causes overinvestment and overconsumption.

In addition, the NPV schedule in figure 3 shows that fractional reserve banking affects NPV rankings. An increase in the supply of loans by fractional reserve banks changes NPV rankings in the same way as an increase in saving:

> «A drop in the gross market rate of interest affects the entrepreneur's calculation concerning the chances of the profitability of

FIGURE 3
FRACTIONAL RESERVE BANKING AND THE NPV



NPV Schedule

Interest Rate	Wooden Bridge	Steel Bridge
10%	**486.85**	-590.97
5.48%	699.10	699.10
3%	828.61	**1,616.73**
1%	940.99	2,500.91

> projects considered… [T]he drop in interest rates [caused by fractional reserve banking] falsifies the businessman's calculation. Although the amount of capital goods available did not increase, the calculation employs figures which would be utilizable only if such an increase had taken place. The result of such calculations is therefore misleading. They make some projects appear profitable and realizable which a correct calculation, based on an interest rate not manipulated by [fractional reserve banking], would have shown as unrealizable.» (Mises 1949, 550)

In terms of the NPV framework, fractional reserve banking causes investor error by falsifying NPV rankings. In figure 3, the saving habits of consumers indicate that consumers prefer the wooden bridge, but the falsified NPV rankings tell the investor that consumers prefer the steel bridge. The 100 percent reserve NPV ranking indicates the steel bridge will destroy wealth, but the fractional reserve NPV ranking indicates the steel bridge will enhance wealth. The artificially low interest rate leads the investor to misallocate resources to the long-term, wealth destroying project. Since the interest rate is the universal NPV input, fractional reserve banking systematically falsifies all NPV rankings in favor of long-term investment projects. An artificially low interest rate

draws investors across the entire economy into longer-term investment projects.[10] Fractional reserve banking causes widespread economic discoordination by extending the time pattern of investment beyond the desired time pattern of consumption. The intertemporal misallocation of resources—too many resources invested in long-term projects—is called malinvestment. Investors must satisfy consumers to earn profits, but these long-term projects will not satisfy the most urgent needs of consumers. Fractional reserve banking leads to systematic wealth destruction by divorcing NPV rankings from consumer demand. Fractional reserve banking causes universal investor error by systematically falsifying NPV calculations.[11]

Business cycles destroy wealth and thereby make society poorer than it otherwise would be. Pre-Keynesian economic theory shows that abolishing fractional reserve banking is the only way to eliminate destructive business cycles. Mises recognized by 1912 that «it would be desirable to put an end to the artificial expansion of fiduciary media. It would not only slow down the rate of [price inflation], but it would also be the best way of preventing economic crises» (1913, 155; 1912, 447, 481-82). Mises claimed, «There should be no more credit expansion. In the future no additional banknotes should be issued, no additional credit should be entered on a bank account subject to check, *unless there is 100 percent coverage in money*. This is the 100-percent plan» (1952b, 74). Pre-Keynesian economic theory supports the abolition of fractional reserves and the establishment of 100 percent reserve banking.[12]

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[10] In *A Treatise on Money* (1931), Keynes admitted that fractional reserve banking affects the time pattern of investment: «The effect of easier credit on the costs of production should be, not to stimulate production all round, but to cause a changeover from certain forms of production to other forms… A fall in the rate of interest stimulates the production of capital goods» (CW 5, 189). Alfred Marshall also believed that fractional reserve banking affects the intertemporal allocation of resources (1879, 163).

[11] Some argue that a central bank is necessary to generate the business cycle. However, «any bank credit expansion in commercial loans is sufficient to generate the business cycle, whether a central bank exists or not» (Rothbard 1992, 880-81; Huerta de Soto 1998, 637, 664-65, 681-82; 2009, 150-51, 160-61; Fuller 2015, 100).

[12] 100 percent reserve banking was the «bedrock and cornerstone» of Mises's proposals for monetary reconstruction after both world wars (1923, 39; 1944, 105-08). Other influential advocates of 100 percent reserve banking include David Hume,

IV
KEYNES AND FRACTIONAL RESERVE BANKING

The pre-Keynesian analysis of fractional reserve banking can be illustrated with the loan market theory, the theory of multiple deposit creation, and the net present value. Together, these three theories support 100 percent reserve banking. But Keynes wrote to Irving Fisher, «on the matter of 100 per cent money I have, however, as you know, some considerable reservations» (Keynes, 1944). So how can Keynes reject 100 percent reserves? Where does Keynes's theory contradict the pre-Keynesian theory? He accepted the theory of multiple deposit creation illustrated in T-account 1, and he accepted the theory of DCF analysis. Thus, Keynes's most obvious departure from the pre-Keynesians was his attack on the loan-market theory.

The Keynesian theory has three components: (1) the theory of effective demand, (2) the liquidity preference theory, and (3) the marginal efficiency of capital. The theory of effective demand represents Keynes's attack on the loan-market theory. As noted, in the loan-market theory, the interest rate is the price that adjusts to balance saving and investment. However, Keynes explicitly rejected the theory. Instead, in his theory of effective demand, the level of income is the factor that adjusts to equalize saving and investment. If investment is greater (less) than saving, then income will rise (fall) until saving equals investment. In the Keynesian theory, income replaces the interest rate as the equilibrator of saving and investment.

The theory of effective demand rules out overconsumption and overinvestment. The loan-market theory shows that fractional reserve banking increases the amount of investment while simultaneously reducing the amount of saving. In contrast to the loan-market theory, Keynes argued that fractional reserve banking increases saving: «A reduction in the rate of interest [by

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Thomas Jefferson, John Adams, Jean-Baptiste Say, David Ricardo, Irving Fisher, Frederick Soddy, Frank Knight, Benjamin Graham, Henry C. Simons, Friedrich Hayek, Maurice Allais, Milton Friedman, James Tobin, and Murray Rothbard. See Huerta de Soto (1998, 716-35) on the advocates of 100 percent reserve banking.

fractional reserve banks] … increases the absolute amount of savings» (CW 14, 243).

> «No amount of actual investment, however great, can exhaust and exceed the supply of savings, which will always exactly keep pace… [I]f the banking system chooses to make the finance available and the investment projected by the new issues actually takes place, the appropriate level of incomes will be generated out of which there will necessarily remain an amount of saving exactly sufficient to take care of the new investment.» (CW 14, 210-11)

The theory of effective demand means saving and investment are always equal. On this theory, fractional reserve banking reduces the interest rate and thereby stimulates investment. The additional investment raises income, and a portion of that new income will be saved. In fact, the amount of saving generated out of the new income will exactly equal the original increase in investment. Thus, any increase in investment stimulated by fractional reserve banking always (instantaneously) creates an equal amount of new saving through the multiplier process.[13] This makes overconsumption and overinvestment impossible in Keynesian theory, so «forced saving is sheer nonsense from beginning to end» (Keynes 1988, H23). Instead, «credit expansion provides not an alternative to increased saving, but a necessary preparation for it. It is the parent, not the twin, of increased saving» (CW 14, 281).

Keynes's theory of effective demand rules out overinvestment and overconsumption by making saving and investment equal at all rates of interest. However, the theory of effective demand left

[13] The fundamental problem with Keynes's investment multiplier is that it is inconsistent with human action. For example, Keynes writes, «The logical theory of the multiplier … holds good continuously, without time lags, at all moments in time» (CW 7, 122). Of course, the multiplier cannot work instantaneously because all human action takes time: «the passage of time is a condition of any given action» (Mises 1933b, 22, 147; 1949, 99-101, 476-77). But if Keynesians admit the multiplier process takes time, then Keynes was wrong that forced saving is impossible. Fractional reserve banking must cause forced saving from the time the multiplier starts until the time it is finished. Keynes was either wrong that the multiplier works instantly, or he was wrong that forced saving is impossible. On the instantaneous multiplier, see Fletcher (1987, 52-53, 56, 81; 2008, 189, 191) and Presley (1979, 168, 171, 173).

him without an interest rate theory: «The initial novelty lies in my maintaining that it is not the rate of interest, but the level of incomes which ensures equality between saving and investment… But the result of it was to leave the rate of interest in the air» (CW 14, 212). The theory of effective demand forced Keynes to develop a new interest rate theory.

Keynes's liquidity preference theory of the interest rate is the second component of his theory. According to the pre-Keynesian theory, the supply and demand for money determines the purchasing power of money (price of money). By contrast, the liquidity preference theory asserts that the supply and demand for money determines the interest rate (price of loans).[14] Just as the theory of effective demand means abandoning the loan-market theory, the liquidity preference theory means abandoning the quantity theory of money.

The pure liquidity preference theory is not a viable interest rate theory, however. Since saving is a function of income in Keynesian theory, the supply of loans (saving) will shift with changes in income. This means the supply and demand for loans cannot determine the interest rate unless we already know the level of income. But we cannot know the level of income until we know the interest rate. For Keynes, then, the loan-market theory is indeterminate (CW 7, 180-81). He writes,

> «In truth there are no such things as these [saving and investment] schedules. They are completely bogus. Without bringing in liquidity preference the position of equilibrium is entirely indeterminate, and any method, such as the classical one, which endeavours to arrive at the rate of interest without bringing in liquidity preference is bound to be circular in the worst possible sense of the word.» (CW 13, 551)[15]

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[14] The liquidity preference theory of the interest rate might appear strange to any person who accepts the law of supply and demand. According to the liquidity preference theory, the supply and demand for one good, money, determines the price of a completely different good, loans. This is analogous to arguing that the supply and demand for wine determines the price of beer.

[15] For more on the alleged indeterminacy of the loan-market theory, see Carabelli (1988, 207), Dillard (1948, 190, 198), Fitzgibbons (1988, 113-23), Fletcher (1987, 120), King (2002, 15), Laidler (1999, 256), Meltzer (1988, 153, 173), Milgate (1982, 111-24), O'Donnell (1999a, 29), Patinkin (1976, 63, 99), and Skidelsky (1992, 560).

Several of Keynes's collaborators recognized that his critique of the loan-market theory also applies to his own pure liquidity preference theory. Like saving, money demand is a function of income in Keynesian theory. Consequently, the pure liquidity preference theory «is indeterminate because the liquidity preference schedule will shift up or down with changes in the income level… In the Keynesian case the money supply and demand-schedules cannot give the rate of interest unless we already know the income level … Keynes' criticism of the classical theory applies equally to his own theory» (Hansen 1953, 140-41). According to Keynes's own argument, the pure liquidity preference theory is a flawed, indeterminate interest rate theory.[16]

The Keynesian IS-LM model solves the problem of indeterminacy. The IS-LM model provides a determinate interest rate theory by combining the theory of effective demand and the liquidity preference theory. The theory of effective demand is used to derive the IS curve, and the liquidity preference theory is used to derive the LM curve. The IS curve and the LM curve simultaneously determine income and the interest rate. For Keynes and his followers, the IS-LM model provides a determinate interest rate theory that also rules out overinvestment and overconsumption. In short, the Keynesian IS-LM model can pose as a refutation of the loan-market analysis of fractional reserve banking shown in figure 1.[17]

The Keynesian IS-LM model eliminates the problem of overinvestment and overconsumption, but the problem of malinvestment remains. In the NPV framework, fractional reserve banks «always

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[16] On the indeterminacy of the pure liquidity preference theory, see Fletcher (1987, 120, 124), Hansen (1953, 147-8), Harrod (1935a, 532; 1935b, 554; 1935c; 1969, 173-74), Hawtrey (1951), Hayek (1941, 330-36), Henderson (1936), Meltzer (1988, 149), Presley (1979, 186-87), and Robertson (1937, 183). Presley notes, «This indeterminateness was resolved by the introduction of the IS/LM framework» (1979, 187).

[17] Some interpreters reject the IS-LM interpretation, but IS-LM is the correct interpretation of *The General Theory*. It is beyond the scope of this paper to justify the IS-LM interpretation. Still, it must be stressed that Keynes invented the IS-LM model during 1933 and presented the IS-LM model for the first time on December 4, 1933, in a lecture at Cambridge (Keynes 1988, B58, E15, G34, J37, M19, N17; Keynes 1989, 125-26; Dimand 2007). Also, the mid-1934 draft of *The General Theory* contains the IS-LM model (CW 13, 439-42, 483-84). See Fuller (2017) for a detailed defense of the IS-LM interpretation of *The General Theory*.

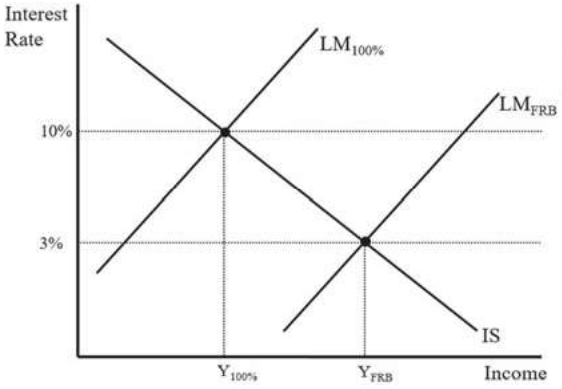
bring about a falsification of the pricing process, and thus a misdirection of production» (Hayek 1933, 74). By itself, then, the IS-LM approach to the interest rate is not sufficient to justify fractional reserve banking. Keynes also had to explain why fractional reserve banking does not falsify economic calculation. So how does Keynes's theory rule out malinvestment? The answer is his marginal efficiency of capital.

Keynes accepted the theory of discounted cash flow analysis, but he used a different approach from the NPV. Specifically, he used the marginal efficiency of capital (MEC) to rank investment projects. Superficially, the MEC and the NPV are concomitant because they are both based on the present value. The MEC is defined as «the rate of discount which would make the present value … equal to its supply price» (CW 7, 135). In other words, the MEC is the discount rate that makes the NPV equal zero. Table 3 shows the NPV of the wooden bridge is zero when the cash flows are discounted at 23.38%. This means the MEC of the wooden bridge is 23.38%. By contrast, the NPV of the steel bridge is zero when its cash flows are discounted at 7.74%, meaning its MEC is 7.74%.

To demonstrate the MEC approach, figure 4 links the MEC schedule and the IS-LM diagram. LM100% represents the Keynesian framework with 100 percent banking, and LMFRB represents the framework with fractional reserve banking. Figure 4 illustrates an important point about Keynesian economics: all else equal, national income is higher with fractional reserve banking than 100 percent reserve banking. The x-axis shows YFRB is greater than Y100%. On the Keynesian theory, fractional reserve banking is beneficial because it increases national income.

According to the MEC rule, investors select the project with the highest MEC. The MEC schedule in figure 4 shows the wooden bridge has the highest MEC, so the investor invests in the wooden bridge. Furthermore, the MEC schedule shows that, in sharp contrast to NPV rankings, MEC rankings do not depend on the interest rate. The wooden bridge always has a higher MEC ranking than the steel bridge, regardless of the interest rate. In figure 4, fractional reserve banking pushes the interest rate down to 3%, but the wooden bridge still has a higher MEC.

FIGURE 4
FRACTIONAL RESERVE BANKING AND THE MEC



MEC Schedule

Interest Rate	Wooden Bridge	Steel Bridge
10%	**23.28%**	7.74%
5.48%	**23.38%**	7.74%
3%	**23.38%**	7.74%
1%	**23.38%**	7.74%

Whereas a lower interest rate changes NPV rankings, a lower interest rate does not change MEC rankings. This illustrates that the interest rate does not affect the intertemporal choice between short-term and long-term projects in Keynes's theory. As a result, fractional reserve banking cannot influence or falsify MEC rankings. The MEC overturns pre-Keynesian insights on fractional reserve banking by making investment rankings insensitive to the interest rate. According to Keynesian economics, fractional reserve banking can create sustainable economic growth without causing overconsumption, overinvestment, and malinvestment.

Keynes's MEC is a substantial but neglected departure from the NPV. The NPV is the universally correct wealth-maximizing investment criterion, and Keynes believed the MEC and NPV yield identical results:

> «Although he does not call it the "marginal efficiency of capital", Professor Irving Fisher has given in his *Theory of Interest* (1930) a definition of what he calls "the rate of return over cost" which is identical with my definition… Professor Fisher uses his "rate of return over cost" in the same sense and for precisely the same purpose as I employ "the marginal efficiency of capital".» (CW 7, 140-41)

Keynes reaffirmed in 1937,

> «The meaning of "marginal efficiency of capital" of which I make use—and which is, in my opinion, the only definition of the term which makes good sense—was first introduced into economic theory by Irving Fisher in his *Theory of Interest* (1930), under the designation "rate of return over cost". This conception of his is, I think, the most important and fruitful of his recent original suggestions.» (CW 14, 101n2)[18]

Keynes is incorrect: his marginal efficiency of capital is not identical to Fisher's rate of return over cost, and they are not used for precisely the same purpose. Table 3 shows that the MEC of the wooden bridge is 23.38% and the MEC of the steel bridge is 7.74%. In distinct contrast, there is only one rate of return over cost (RROC), and it is 5.48%. Whereas the MEC is calculated with the cash flows from only one project, the RROC is calculated with the cash flows from two projects. Thus, they are not identical. Moreover, they are not used for the same purpose. Fisher invented the RROC to show that NPV rankings are interest rate sensitive and switch at the RROC. As demonstrated, MEC rankings are not interest rate sensitive. His claim that the MEC and RROC are identical shows that Keynes had a defective understanding of the time value of money and interest rate sensitivity.

Keynes thought the MEC will always give the same investment rankings as the RROC and NPV. This means he believed he had a wealth-maximizing theory of investment. But Keynes was wrong: the MEC does not give the same rankings as the NPV. The NPV schedule in figure 3 shows that the investor will allocate resources

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[18] Keynes falsely attributed the MEC to Fisher. In reality, he developed the MEC independently (Kent 2014). Keynes and not Fisher is responsible for injecting the flawed MEC, or internal rate of return, into economic theory and finance. His error still haunts business. In fact, Graham and Harvey (2001, 197) found that 76% of chief financial officers use Keynes's flawed approach to rank investment projects. Unfortunately, many influential Keynes interpreters have claimed that the Keynes's MEC is identical to Fisher's analysis, including Carabelli (1988, 208), Dillard (1948, 134), Dimand (1988, 185), Fitzgibbons (1988, 120), Fletcher (1987, 138), Hansen (1953, 118), Kahn (1984, 146), Laidler (1999, 254), Lawlor (2007, 150), O'Donnell and Rogers (2015, 4n3), Patinkin (1976, 80), Schumpeter (1946, 510n25), and Skidelsky (1992, 555).

to the steel bridge when the interest rate is 3%, but the MEC schedule in figure 4 shows that the investor will allocate resources to the wooden bridge. In this example, the MEC contradicts the NPV because the interest rate (3%) is below the RROC, or crossover rate (5.48%). As a rule, the MEC contradicts the NPV whenever the interest rate is below the crossover rate.[19] Since the MEC contradicts the NPV, Keynes does not have a wealth-maximizing theory of investment. When the interest rate is 3%, the NPV rule tells the wealth-maximizing investor to select the steel bridge because it increases wealth by $1,616.73. In sharp contrast, the MEC rule tells the investor to select the wooden bridge even though it only increases wealth by $826.61. The Keynesian theory of investment is logically defective because the MEC is not a wealth-maximizing approach to ranking investment projects.[20] Keynes can only justify fractional reserve banking by using a fundamentally flawed, non-wealth-maximizing approach to investment. Keynesian economics is a flawed justification for fractional reserve banking because Keynes does not have a wealth-maximizing theory of investment.

V
INVESTOR ERROR AND THE BUSINESS CYCLE

Business cycle theory must explain the cyclical recurrence of universal investor error. As Murray Rothbard notes, «The main problem that a theory of depression must explain is: *why is there a sudden*

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[19] There are several other technical problems with the MEC. First, the MEC gives multiple solutions when a project has non-normal cash flows. Second, the MEC assumes cash flows are reinvested at the MEC instead of the interest rate. Finally, the MEC is incompatible with the Keynesian liquidity preference theory of the yield curve. See Lorie and Savage (1954) and Solomon (1956).

[20] Armen Alchian (1955) developed this proof. He writes, «Keynes' internal rate of return did not give an investment demand function according to the maximum present wealth criterion of choice by investors» (1955, 941). Unfortunately, Alchian incorrectly concluded that Keynes's error is «harmless» (1955, 942). As shown here, Keynes's error is by no means harmless, because the MEC prevents the interest rate from determining short-term versus long-term investment. For different reasons, Patinkin found that Keynes does not have a profit-maximizing theory (Patinkin 1982, 130, 143; Sheehan 2010, 58-62). Minsky (1975, 100) also criticized the MEC.

general cluster of business errors?» (1963, 8; Mises 1949, 583). Investor error must ultimately be explained in the framework of DCF analysis. Simply put, a successful business cycle theory must explain why DCF analysis fails for all investors at the same time, and it must explain why these universal failures of DCF analysis recur in a cyclical manner. As noted, in the DCF framework, investment decisions are completely determined by the interest rate and the cash flow forecast. Therefore, any failure of DCF analysis can only have two potential causes: (1) an incorrect interest rate or (2) an incorrect cash flow forecast. The DCF framework places strict but constructive limits on business cycle theory. Specifically, DCF analysis means there are only two viable approaches to the business cycle: (1) the interest rate approach, or (2) the cash flow approach.

Mises advocated the interest rate approach to the business cycle in which a falsified interest rate causes universal clusters of DCF failure. Mises's interest rate approach to universal investor error appears more natural than the cash flow approach for one simple reason: the interest rate is the universal price used in all economic (DCF) calculation. While cash flow forecasts are never universal and always specific, the universality of the interest rate makes it especially well-suited to explaining universal falsifications of DCF analysis. Mises showed fractional reserve banking falsifies the universal price—the interest rate—and accordingly causes a universal falsification of NPV rankings. Moreover, the cyclical expansion and contraction of the fractional reserve banking system explains the cyclical recurrence of universal DCF failures.

The MEC rules out the interest rate approach to DCF failure. Consumption is the ultimate purpose of investment in production, and investors can only maximize wealth by maximizing consumer satisfaction. The interest rate is the price of time in the NPV framework, and investors must invest in accordance with this price if they want to maximize consumer satisfaction and, by extension, their own wealth.[21] By contrast, investors are not wealth-maximizers in

[21] Mises writes, «The exchange ratio [interest rate] embodied in the [credit or loan] contract contains an expression of the value of time» (1912, 296). Rothbard writes, «The interest rate is the price of "time"» (1957, 593).

Keynes's theory because the MEC prevents the interest rate from functioning as the price of time. MEC rankings are completely determined by the investor's cash flow forecasts. The interest rate is not required to calculate the MEC, and projects are ranked according to the MEC without reference to the interest rate. The interest rate is only a hurdle rate introduced after the competing projects are already ranked by the MEC. All this means that a falsified interest rate can never falsify DCF analysis in Keynes's theory.

In stark contrast to Mises's interest rate approach, Keynes adopted the cash flow approach to universal investor error. Keynes's cash flow approach blames all DCF failures on cash flow forecasting. Mises stressed uncertainty, but uncertainty about future cash flows is overwhelmingly important in Keynes's theory. Like his predecessors in the Cambridge school, Keynes was extremely pessimistic about investors' ability to successfully forecast cash flows.[22] He argued that successful cash flow forecasting is virtually impossible because «our knowledge of the future is fluctuating, vague, and uncertain» (CW 14, 113). His theory of long-term expectations means investors' cash flow forecasts are almost always incorrect. Furthermore, cash flow forecasts are volatile because they depend on investors' erratic «animal spirits» and «uncontrollable and disobedient psychology» (CW 7, 162, 317). For Keynes, irreducible uncertainty about future cash flows means DCF analysis is destined to constantly fail:

> «The outstanding fact is the extreme precariousness of the basis of knowledge on which our estimates of [cash flows] have to be made. Our knowledge of the factors which will govern the [cash flows] of an investment some years hence is usually very slight and often negligible. If we speak frankly, we have to admit that

[22] Keynes inherited his pessimistic view of cash flow forecasting from his predecessors at Cambridge: «Like Marshall, [the Cambridge cycle theorists] regarded the cycle as driven mainly by investment demand, and they were extremely sceptical of the capacity of businessmen to make well-calculated, let alone rational, investment decisions» (Laidler 1999, 15). Generally, Keynes and the Cambridge cycle theorists resented business and businesspeople. Skidelsky bluntly stated, «Keynes had little respect for the business vocation… What chiefly impressed Keynes about British businessmen was their stupidity and laziness» (1992, 259; Johnson and Johnson 1978, 105).

> our basis of knowledge for estimating [cash flows] ten years hence … amounts to little and sometimes to nothing; or even five years hence.» (CW 7, 149)

In terms of the IS-LM model, investors' cash flow forecasts determine the position of the IS curve and, therefore, the level of employment. Keynes writes, «increase or decrease of employment is associated with an increase or decrease of quasi-rent [cash flow forecasts]» (1988, J23). Pervasive uncertainty about future cash flows means the IS curve is normally located at a suboptimal position: to the left of its full-employment position. Since investment is chronically weak, «there should be on the average a tendency to severe unemployment» (1988, L9). For Keynes, chronic economic stagnation and unemployment is the normal feature of the free market economy.

Moreover, fluctuations of investors' cash flow forecasts cause the business cycle. Depressions are caused by a sudden collapse of the MEC. In terms of the IS-LM mode, a sudden decrease in expected cash flows reduces the MEC and shifts the IS curve left. He writes, «Our [cash flow] expectations are very flimsily based, and therefore very susceptible to changes in atmosphere; as a result the marginal efficiency of capital is subject to very rapid fluctuation. This is the fundamental explanation of the violent changes associated with the trade cycle, and of the general instability of the economic system» (1988, H29). Keynes's theory of cash flow forecasting makes uncertainty bearing investor-entrepreneurs responsible for society's economic problems, chronic stagnation and the business cycle.[23]

For Keynes, irreducible uncertainty about future cash flows is the fundamental and insoluble problem with the free market economy. He writes, «The weakness of the inducement to invest has been

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[23] This theory invites the question: if investors are such incompetent forecasters, then why should fractional reserve banks be allowed to put their depositors' property at risk by making loans to investors? Moreover, consistently applied, Keynes's theory of cash flow forecasting must also apply to the fractional reserve bankers. It would mean fractional reserve bankers cannot accurately assess default risk. If the Keynesian theory of cash flow forecasting was correct, it would actually give reason to restrict fractional reserve banking.

at all times the key to the economic problem» (CW 7, 347-48). Inherent cash flow uncertainty makes chronic economic stagnation and the business cycle inherent features of the free market economy. Since it is impossible to eradicate the cash flow uncertainty that causes chronic economic stagnation and the business cycle, countercyclical policy cannot permanently solve the economic problem. Contrary to many interpreters, Keynes did not believe monetary policy, public works, deficit spending, or any other countercyclical measure could save capitalism. To Keynes, the only permanent solution is socializing investment: «A somewhat comprehensive socialisation of investment will prove *the only means* of securing an approximation of full employment»; and «the *only solution* is for long-term investment to be controlled by the State» (CW 7, 378; 1989, 154, emphasis added). In short, Keynes argued that inexorable uncertainty about future cash flows means capitalism must be replaced by non-Marxist socialism (O'Donnell 1999b; Fuller 2017).[24]

Keynes's entire case against free market capitalism depends on his theory of investment, but is his theory viable? Keynes's approach to the time value of money is a fundamental error. As shown above, Keynes's theory of investment is logically defective because the MEC is not a wealth-maximizing approach to ranking investment projects. This alone is enough to repudiate Keynesian economics. In addition to the defunct MEC, however, there are two fundamental problems with the Keynesian theory of cash flow forecasting.

First, Keynes's theory of cash flow forecasting is incompatible with his IS-LM model. As noted, the pure liquidity preference theory is indeterminate, and the IS-LM model is necessary to solve the problem of indeterminacy. But the IS-LM methodology solves the problem of indeterminacy by resorting to a general equilibrium, simultaneous equations model: «everything should be in terms of simultaneous equations,» and «the amount of employment will be

[24] Keynes did not realize that socializing investment would make DCF analysis impossible (Mises 1922, 110-30; 1949, 694-711; Rothbard 1962, 614-15; 1991; Huerta de Soto 1992). In other words, it is impossible to make NPV or MEC calculations in the world of socialized investment. But even if MEC calculations were possible under socialism, central planners would still face irreducible uncertainty when forecasting cash flows. Thus, even if it were possible to forecast cash flows in a socialist society, socializing investment would not eradicate uncertainty.

determined by a set of simultaneous equations» (Keynes 1988, A43; CW 29, 65).[25] By definition, however, general equilibrium is a world with no uncertainty (Davidson 1972, 872; Rothbard 1987, 261). Since there is no uncertainty about future cash flows in general equilibrium, the NPV of every project is always zero and the MEC of every project always equals the interest rate.[26] In general equilibrium, investment cannot be chronically weak and the MEC cannot suddenly collapse. Therefore, the IS-LM methodology required to solve the problem of indeterminacy rules out the cash flow uncertainty that makes free market capitalism unworkable. Keynes's IS-LM model is logically incompatible with his theory of cash flow forecasting, and, as a result, the Keynesian explanation of chronic stagnation and business cycles is logically defective.[27]

Second, Keynes's cash flow approach to the business cycle is untenable. Uncertainty makes specific cases of individual forecasting error inevitable on the free market. At any given time, some investors will overestimate cash flows and some investors will underestimate cash flows. However, business cycle theory must explain the universality and cyclicality of DCF failure. Cash flow forecasts are specific, not universal, and uncertainty alone cannot explain why all investors' cash flow forecasts fail at the same time or why these universal failures recur in a cyclical fashion. The problems

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[25] Keynes always approved the simultaneous equations approach (CW 7, 299; CW 13, 403, 405; CW 14, 478; CW 29, 98; 1988, A38, G14, I21; 1989, 76-77, 80, 110). On IS-LM and general equilibrium, see Davidson (2007, 176, 185), Dimand (2007, 92), Hicks (1936, 238), Laidler (1999, 6, 315), Lange (1938, 13), Meltzer (1988, 196), O'Donnell and Rogers (2015, 2, 9), Patinkin (1976, 98, 101), Solow (1984, 18), and Young (1987, 57, 82, 124).

[26] Huerta de Soto writes, «Entrepreneurship is a typical phenomenon of the real world, which is always in disequilibrium and cannot play any part in the models of equilibrium» (2009, 35). Dynamic stochastic general equilibrium is not a solution because it only introduces risk, not uncertainty. Like Mises and Knight, Keynes would reject this approach because he recognized that cash flow forecasting is a problem of uncertainty rather than risk.

[27] The logical incompatibility of Keynes's IS-LM model and his theory of uncertainty explains the existence of two competing schools of Keynesianism: orthodox IS-LM Keynesianism and post-Keynesianism. Post-Keynesians dodge the general equilibrium problem by rejecting the IS-LM interpretation, but they covertly settle for the indeterminate pure liquidity preference theory. The historical evidence supports the orthodox IS-LM interpretation (Fuller 2017). Post-Keynesians are actually attacking Keynes's own theory when they attack IS-LM.

of universality and cyclicality led Keynes to introduce his famous concept of animal spirits. To Keynes, investors are lemmings who imitatively adjust their cash flow forecasts with one another during waves of investor optimism and pessimism. Keynes's theory of investors' "animal spirits" and "uncontrollable and disobedient psychology" is a psychological theory, not an economic theory. Still, can animal spirits explain the universality and cyclicality of DCF failure?

Contrary to Keynes, economic theory shows that cash flow forecasting cannot explain the business cycle (Hayek 1929, 40-42; Rothbard 1963, 80-81). The free market has a built-in natural-selection mechanism that weeds out investors with uncontrollable animal spirits (Mises 1949, 580; Rothbard 1962, 514-16). Investors who forecast future cash flows successfully earn profits and enhance wealth, whereas investors who forecast future cash flows unsuccessfully suffer losses and destroy wealth. Investors who tame their animal spirits, and thereby normally forecast cash flows successfully, will accumulate more and more wealth and gain control over more and more investable resources. Conversely, investors who succumb to their animal spirits, and thereby normally make poor cash flow forecasts, will lose control over more and more investable resources until they are driven out of the investing business. In this way, the market process tends to weed out unsuccessful forecasters and transfer control over investable resources into the hands of the most capable cash flow forecasters. The free market's built-in natural-selection mechanism means cash flow forecasting cannot explain the universality and cyclicality of DCF failure during the business cycle: «A satisfactory explanation of business fluctuations must not be built upon the fact that individual firms or groups of firms misjudge the future state of the market and therefore make bad investments» (Mises 1949, 583). The cash flow approach is flawed, and the interest rate approach is the only viable approach to the business cycle.

VI
CONCLUSION

Keynes's theory of investment is the key to Keynesian economics. The theory of effective demand is a necessary part of Keynes's

theory, but it is not sufficient. Even if one accepts the theory of effective demand, there is no chronic stagnation, business cycle, or mass unemployment in Keynes's theory if the investment market functions properly (Hansen 1953, 34). Thus, Keynes's theory of investment based on the MEC is the key to Keynesian economics. However, his theory of investment is wrong. The MEC is not a wealth-maximizing approach to ranking investment projects, and his theory of cash flow forecasting is defective. Keynes's theory of investment is the fundamental problem with Keynesian economics, and it means his theory is fatally flawed. Therefore, Keynesian economics cannot successfully justify fractional reserve banking, countercyclical government policy, socialism, or any other violent intervention in the free market economy.

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