

ARE PARADIGMATIC ANALYSES USEFUL? THE CASE OF MONETARISM, THE AUSTRIAN SCHOOL, AND THE BRAZILLIAN ECONOMY OF 2004-2016

Henrique Lyra Maia, FUCAPE Business School

Dale Steinreich, Drury University

ABSTRACT

One recent graduate-student-authored working paper that sparked a chuckle among several of its readers asserted that rapidly increasing real GDP in the short run caused by an unanticipated increase in the money supply "proves the validity of monetarism." The claim was ridiculed because the Keynesian and Austrian macroeconomic schools hold the same tenet, thus the unique validity of monetarism was not proven by the student. This turned out to be an unpleasant surprise to the paper's mathematically gifted but economically challenged author. The present writers are sympathetic. An earlier version of this paper analyzed Brazil's 2004-2016 business cycle, which included the nation's worst economic recession in more than a century. The behavior of different macroeconomic aggregates was examined, including real GDP, the money supply, interest rates, savings, industrial production of higher- and lower-order goods, and inflation. While the paths of said aggregates were found to well fit the pattern of predictions made by Austrian Business Cycle Theory (ABCT) with the authors ready to begin statistical tests, some thoughtful off-the-record criticisms advised gathering more data and evaluating them in light of the theoretical predictions made by ABCT's main competing paradigm, monetarism. Hence the purpose of this paper. The results reveal that the critics had a valid point: when a new paradigm is brought into the picture, what previously looked like a good-enough fit can change. Thus, the value of paradigmatic analysis, an analytic method undertaken way too infrequently today.

Keywords: Monetarism; Austrian Business Cycle Theory (ABCT); Brazil; Recession; Macroeconomics.

INTRODUCTION

Since the beginning of the Twentieth Century, long-term economic growth in Brazil has been elusive. While the last ten recessions (not counting the recent COVID-19 recession) have averaged 4.2 months (Federal Reserve Economic Data, "Total Gross Domestic Product for Brazil") compared to 11.1 in the U.S. (National Bureau of Economic Research, "U.S. Business Cycle Expansions and Contractions"), those ten Brazilian recessions took place inside of just seven years (third quarter of 2012 to third quarter of 2019) while in the U.S. the last ten recessions (again, not counting COVID-19) took place between July 1953 to June 2009, a period of 55 years and 11 months.

The perennial dispute in policymaking circles in Brazil centers on which factors lie behind the nation's inability to sustain long-term economic growth. Motivated by this debate, this paper will

analyze Brazil's latest severe recession considering monetarism and Austrian Business Cycle Theory (ABCT).

LITERATURE REVIEW

Monetarism

Monetarism has roots extending back to Richard Cantillon (1680-1734), Henry Thornton (1760-1815), David Ricardo (1772-1823), and John Stuart Mill (1806-1873). All of these theorists understood that greater quantities of money increased demands for goods and services and thus raised prices (Ekelund and Hebert, 1990, p. 537). Irving Fisher (1867-1947) and Knut Wicksell (1851-1926) explored long-run issues with respect to money and macroeconomic stability (Ekelund and Hebert, 1990, p. 537). However, the most renowned monetarist of all time remains Milton Friedman (1912-2006), whose *Monetary History of the United States, 1867–1960*, written in 1963 with Anna Schwartz, posited the monetary causes of the Great Depression and helped Friedman win the Nobel Memorial Prize in Economic Sciences in 1976. According to Friedman, "Inflation is always and everywhere a monetary phenomenon" (1968, p. 39).

Despite Austrian micro- and macroeconomics (including ABCT) experiencing a revival for at least the past two decades, monetarism is still ABCT's chief and mainstream competitor. Monetarism is built around three propositions (Meltzer, 1993):

1. Inflation is produced when money continuously grows at a rate higher than that of real output. The relationship between money growth and inflation is not rigid. Money growing at a higher rate than real output is a necessary but not sufficient condition for inflation.
2. When expected inflation is high, nominal interest rates will be high and the value of the inflated currency will fall relative to that of more stable currencies. The relationship between inflation and currency depreciation is not one to one. However, continuous inflation produces currency depreciation and continuous disinflation produces currency appreciation.
3. The effects of money growth are first felt on output, and then on the price level.

Three corollary and causal relationships related to the aforementioned three propositions are:

- A. Excessive money growth leads to inflation and high nominal interest rates.
- B. Unanticipated increases in money growth lead to short-term increases in real GDP (booms).
- C. Unanticipated declines in money growth lead to short-term decreases in real GDP (recessions).

Two ideas from classical economics embraced by monetarists are *classical dichotomy* and *monetary neutrality*. The classical dichotomy is that real and nominal variables can be separated for analysis while monetary neutrality holds that changes in the money supply affect only nominal variables and not real ones over the long run. These classical ideas are compatible with not only the monetarist *quantity theory of money* (explained below) but also the real business cycle school of macroeconomics.

Monetarism: Some Empirical Evidence

Space constraints preclude adducing evidence for all of the aforementioned relationships in monetarist theory. What will be reviewed is evidence supporting proposition 1: the relationship between money growth and inflation is not a mechanistic, rigid relationship like that between the handlebars of a bicycle and the bicycle's front tire. It is much more like the turning of a very large ship's rudder wheel and the eventual change in direction of travel of said very large ship. Table 1 below illustrates this.

Table 1. Money Growth and Inflation in the U.S. 1960-1991		
	Money Growth (%)*	Inflation (%)*
1960-1964	2.8	1.6
1965-1969	4.9	3.7
1970-1974	6.0	6.0
1975-1979	6.9	7.9
1980-1984	6.6	7.3
1985-1989	7.2	3.5
1987-1991	4.4	3.8
*compound annual rate		
Source: Meltzer 1993		

What can be seen in the four-year intervals from 1960 to 1991 is that when money growth tends to rise, the inflation rate tends to rise as well. When money growth tends to fall, the rate of inflation tends to fall. The only clear exception is the 1985-1989 period, where money growth rises at a rate higher than that in any other four-year interval in the sample period (7.2%) yet the rate of inflation for this four-year period (3.5%) was lower than that of any other four-year period in the sample save one (1960-1964: 1.6%). Monetarists believe that the likely culprit of this steep fall in inflation was strong economic growth from the mid- to late 1980s. These data demonstrate the monetarist proposition that money growth tends to drive inflation, but the relationship is not strictly mechanical. Changes in economic growth can not only disrupt what seems like a dependable pattern, but changes in money velocity (the rate at which money moves from one individual to another) can have the same disruptive effect. The relationships among all of these variables can be seen in the famous *equation of exchange* (EOE) tautology

$MV = PQ$ where

MV = nominal spending in an economy

PQ = nominal GDP

and separately:

M = money supply

V = velocity

P = price level

Q = real GDP

These relationships are applied in the quantity theory of money, where V (assumed to be stable) is relatively constant in the short run, Q is relatively constant in growth rate over the short run, and

M determines the price level, P , with changes in M determining the rate of inflation (change in P). Per monetary neutrality, real GDP (Q) is not affected by the money supply (M) over the long run (Wen, 2006).

Austrian Business Cycle Theory (ABCT)

The first and most fundamental version of ABCT was first delineated by Ludwig von Mises (2008, 2009). ABCT was then further refined by Friedrich August von Hayek (1931a, 1931b, 1933), Murray Rothbard (2000, 2009), and Roger Garrison (1978, 1997, 2001, 2004, 2012). Recent revisions have been explicated by Carilli and Dempster, 2001; Evans and Baxendale, 2008; Engelhardt, 2012; Salerno, 2012; Macovei, 2015; and Giménez Roche, 2014.

While changes in fiscal policy do not necessarily affect every transaction in an economy, monetary policy is a different story. Business cycles can begin when unanticipated money creation forces interest rates below their natural market level (where more money means lower costs of borrowing), stimulating artificial development of capital-goods (e.g., large machinery, heavy equipment) industries (Mises, 2008). In addition, consumption will also be stimulated as consumers will have an incentive to spend more and save less since credit-card interest rates will have fallen as well as interest rates on savings accounts. When spending on both consumption and capital goods is stimulated, a tug-of-war competition for scarce resources ensues (Garrison, 2001).

The first stage of the new business cycle is a boom that is the result of the stimulated dual spending on consumer and capital goods. A euphoria of prosperity prevails (Mises, 2011, p. 564). The new artificially lower interest rates drive growth of real output. Consumer and capital projects are implemented, with the latter being more sensitive to interest-rate changes and money growth because capital-goods/higher-order manufacturing requires more investment than consumer-goods/lower-order manufacturing. Thus, capital projects will begin growing at a higher rate than consumer projects (Hayek, 1931a).

Because of natural scarcity alone, an economy will not have all the resources necessary to complete all the consumer and capital projects being simultaneously pursued under these conditions. On the one hand, qualified labor and land (factors of production) are scarce resources and simultaneous competition for them for consumer and capital projects will lead to their prices rising (Garrison, 2001, p. 72). On the other hand, capital is also a scarce resource and, when purchased with newly created money, its price rises as well (Mises, 2008, p. 550).

The problem comes when consumers and firms discover that the source of increased spending in the economy is money creation rather than a natural increase in the productivity of workers and firms. The result is inflation, a general increase in prices in an economy. Thus, the nominal interest rate (real interest rate + inflation premium) rises as lenders add an inflation premium onto the real interest rate to compensate for the fall in the purchasing power of the currency unit.

Inevitably, a recession will follow and pessimistic expectations in the market will turn projects once deemed profitable into malinvestments (Rothbard, 2009; Holcombe, 2017). Banks will then tend to impose greater restrictions on lending because of negative expectations for the economy. The result is a leveling off or fall in money expansion (Mises, 2008, p. 565).

Intersections and Divergences

Monetarists and Austrians agree on some points. Both see positive unanticipated changes in the rate of money growth as the ultimate driving force behind unsustainable booms. Both see the importance of the distinction between real and nominal interest rates. Both see monetary relationships as lending support to institutional rules as opposed to policy activism. Keynesian fine-tuning of the economy (stimulating growth during recessions and curtailing it during booms) is frowned upon by both schools.

In terms of differences, Austrians see a particular order of events in business cycles: monetary expansion; falling interest rates; a boom characterized by malinvestment, overconsumption, and an unnaturally distorted structure of production; then an eventual turning point characterized by rising nominal interest rates (with inflation premiums now built into each rate); and then a recession with liquidation of malinvestments. The process follows a sine wave every time in terms of pattern: rise, peak, and fall. What also seems to be implied in some sources is that most if not all periods of strong growth are driven by excessive growth in the money supply.

Monetarists see the Austrian cycle as too rigid. An economy can be growing at a significant rate (say, 3 percent) with low inflation and an unanticipated change in the money supply can induce a more intense boom or recession depending on the direction of change. An even more intense boom would be triggered by an unanticipated increase in the money supply while a recession would be induced by an unanticipated decrease in the money supply. Monetarists believe that an unanticipated drop by almost one third in the U.S. money stock between 1929 and 1933 was the primary cause of the Great Depression. In contrast, Austrians believe that the business cycle containing the Great Depression was initiated by an increase in the money supply in the 1920s which ultimately proved unsustainable. For monetarists, the secondary factors creating the Great Depression included very badly timed increases in taxes and tariffs, and Austrians for the most part agree with these secondary factors.

METHODOLOGY

To accurately designate the different phases of the business cycle and examine other phenomena, the relevant macroeconomic variables were identified and collated.

1. Real GDP
2. Price level/Inflation
3. Money supply
4. Velocity
5. Exchange rate
6. Interest rate
7. Credit expansion
8. Savings
9. Industrial production of higher-order (capital) goods
10. Industrial production of lower-order (consumer) goods

From the monetarist perspective, Table 2 below lists the expected behaviors of these aforementioned ten variables throughout a business cycle.

TABLE 2. EXPECTED RESULTS (MONETARISM) †		
VARIABLE	BOOM	BUST
Real GDP (Q)	Positive rate of growth (by definition).	Negative rate of growth (by definition).
Price level/Inflation (P)	Rises, falls, or remains constant (equation of exchange).	Rises, falls*, or remains constant* (equation of exchange).
Money supply (M)	Rises, falls*, or remains constant* (equation of exchange).	Rises, falls*, or remains constant (equation of exchange).
Velocity (V)	Stable.	Stable.
Exchange Rate	Rises or falls with the money supply (proposition 2).	Rises or falls with the money supply (proposition 2).
Interest rate (nominal)	Rises, falls, or remains constant with expected inflation (proposition 2).	Rises, falls, or remains constant with expected inflation (proposition 2).
Credit expansion	No prediction.	No prediction.
Savings	No prediction.	No prediction.
Industrial production of higher-order goods	No prediction.	No prediction.
Industrial production of lower-order goods	No prediction.	No prediction.
†The extensive EOE derivations required to arrive at the boom and bust predictions for the EOE variables M , V , and P are not provided in this paper because of space constraints. *Possible but highly unlikely scenarios given central-bank norms.		

From the perspective of the Austrian school, Table 3 below lists the expected behaviors of the ten variables throughout a business cycle.

TABLE 3. EXPECTED RESULTS (ABCT) †		
VARIABLE	BOOM	BUST
Real GDP	Rises (Mises, 2008, p. 610).	Falls (Mises, 2008, p. 610).
Price level/Inflation	Rises (Mises, 2008, p. 550).	Levels out or falls (Mises, 2008, p. 566).
Money supply	Rises (Haberler, 1983, p. 9).	Levels off or falls (Haberler, 1983, p.9).
Velocity	No prediction.	No prediction.
Exchange Rate	No prediction.	No prediction.
Interest rate (nominal)	Falls (Garrison, 2001, p. 69).	Rises (Garrison, 2001, p. 72).
Credit expansion	Rises (Mises, 2008, p. 549).	Falls (Mises, 2008, p. 565).
Savings	Stagnates, falls, or rises less than credit expansion (Garrison, 2001, p. 70).*	No explicit prediction.
Industrial production of higher-order goods	Rises more than lower orders (Rothbard, 2009, pp. 19-20).	Falls more than lower orders (Rothbard, 2009, pp. 19-20).
Industrial production of lower-order goods	Rises less than higher orders (Rothbard, 2009, pp. 19-20).	Falls less than higher orders (Rothbard, 2009, pp. 19-20).
†Unlike monetarism, the boom and bust predictions contained in this table (where applicable) are derived only from theory. *No explicit prediction for this was found in ABCT but instead was deduced from the theory of Garrison (2001) in which it is impossible to have growth in credit markets when savings falls except in the case of policy intervention.		

THE BRAZILIAN CYCLE

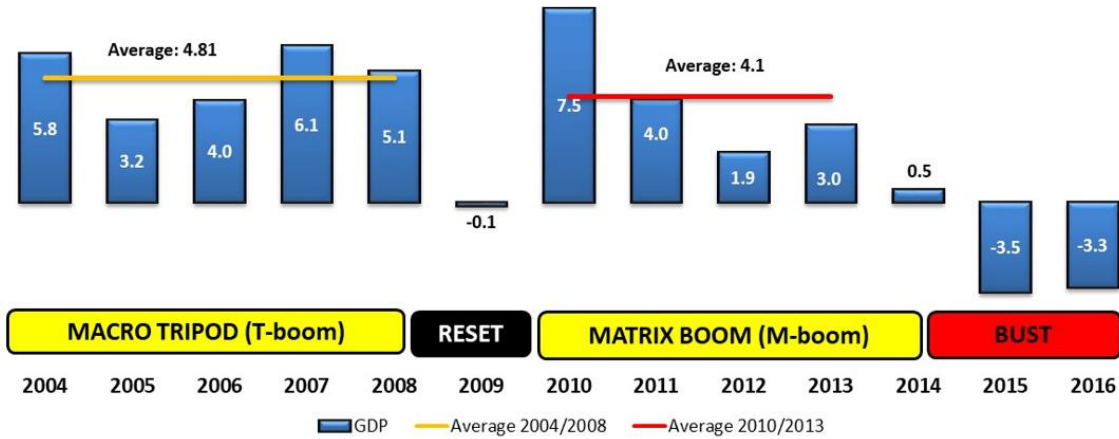
Real GDP

Figure 1 below displays average yearly real GDP growth for Brazil for 2004-2016. As can be seen, growth was positive for all years for 2004-2014 except for 2009. The Tripod period (2004-2008, named after the "Tripod" economic agenda of President Fernando Henrique Cardoso) had an average 4.81-percent annual growth rate. The interim year 2009 was characterized by low negative

average growth of -0.1 percent. From 2010 to 2013 (in the Matrix period named after the "New Matrix" economic agenda of President Luiz Inácio Lula da Silva), annual growth averaged 4.1 percent. The economy experienced very low growth in 2014 before sinking into a deep recession with -3.5 and -3.3 percent growth in the years 2015 and 2016, respectively. The recession ended in the first quarter of 2017 when the Brazilian economy experienced a positive quarterly increase in real GDP of 1 percent (hence this period is not shown in the figure).

The Reset year of 2009 (with first- to fourth-quarter growth rates of real GDP of -2.4, -2.2, -1.2, and 5.3, respectively; IBGE, 2020) is the first juncture at which monetarism and the Austrian school would diverge. In terms of the period illustrated in Figure 1, monetarists see the 2004-2009 interval as one business cycle, while the fourth quarter of 2009 through the fourth quarter of 2016 interval marks the second business cycle. Austrians see the entire 2004-2016 period as representing a single business cycle. For expositional simplicity, this paper will treat the 2004-2016 period as a single cycle, thus "cycle" will refer to the entire 2004-2016 period unless noted otherwise.

Figure 1. Brazil’s Average Annual Growth in Real GDP (2004-2016)



Source: Central Bank of Brazil. GDP series 7326.

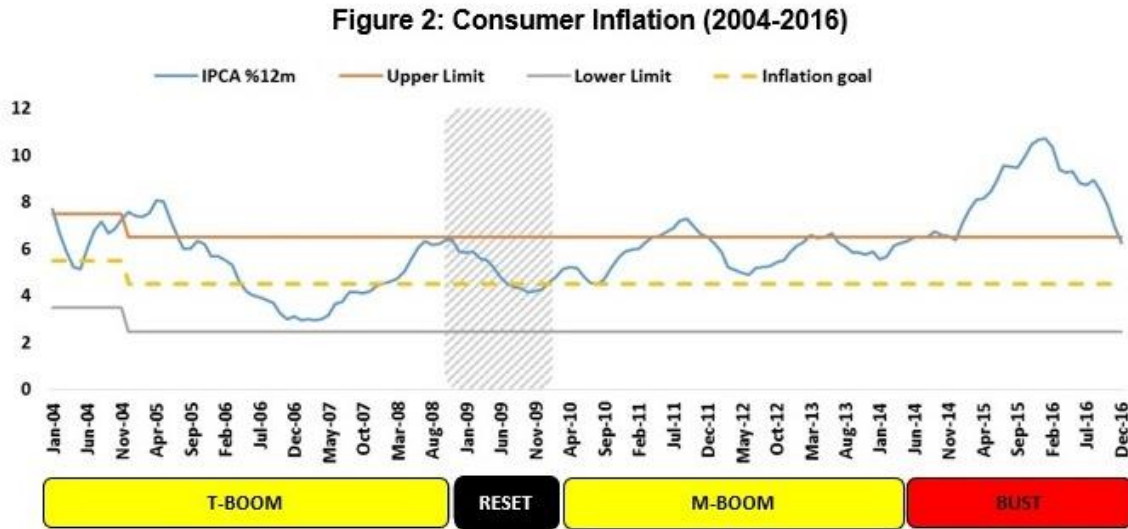
Table 4 below divides the 2004-2016 Brazilian cycle into three phases. Phase 1 will correspond to the years 2004-2008, the boom of the Macro Tripod policy years. Phase 2 will correspond to the years 2010-2014, the boom of the New Matrix years, but also (for analytic simplicity) extend back into the recession year of 2009 (Reset). Finally, Phase 3 will correspond to the bust years of 2014-2016.

Phase	Stage of Business Cycle	Label	Time Period
1	Boom	Macro-Tripod Boom (T-boom)	Jan. 2004-Sep. 2008*
2	Boom	Reset + Economic-Matrix Boom (Reset + M-boom)	Reset: Oct. 2008-Dec. 2009 M-boom: Jan. 2010-Feb. 2014
3	Bust/Recession	Bust	Mar. 2014-Dec. 2016

*The precise monetarist dating for this period would be from the fourth quarter of 1999 to the third quarter of 2009.

Price Level/Inflation

Figure 2 below shows the performance of consumer inflation during the three phases of the cycle. The most remarkable pattern revealed is the gradual loss of control by the Brazilian central bank. As will be seen, the periods in which inflation was mostly outside of the Brazilian central bank's (*Banco Central do Brasil*, or BCB for short) target range were mainly in the bust phase.



Source: Central Bank of Brazil (BCB). IPCA series 13522. Inflation target series 13521.

According to Table 5 below, in 49 months of Phase 1, inflation was within BCB’s target range, a success rate of approximately 88 percent. Inflation averaged about 5.3 percent per annum during this period. Phase 2 had similar results. During the bust, Brazil’s inflation rate was higher than in any other phase. In January 2016, inflation reached a peak of 10.71 percent, the highest level for Brazil in the previous 13 years. During the bust, inflation was within its target range for only five months out of 34, giving BCB a rather unimpressive success rate of 15 percent!

Phase	Label	Months within target range	Months outside target range	% within target range	Total months in period	Average inflation rate (% in period)
1	T-boom	49	7	88%	56	5.3%
2	Reset + M-boom	54	12	82%	66	5.7%
3	Bust	5	29	15%	34	8.2%
Total		108	48	69%	156	6.1%

For the classification of inside or outside the target range, the inflation range set by BCB was used (Central Bank of Brazil 2018).

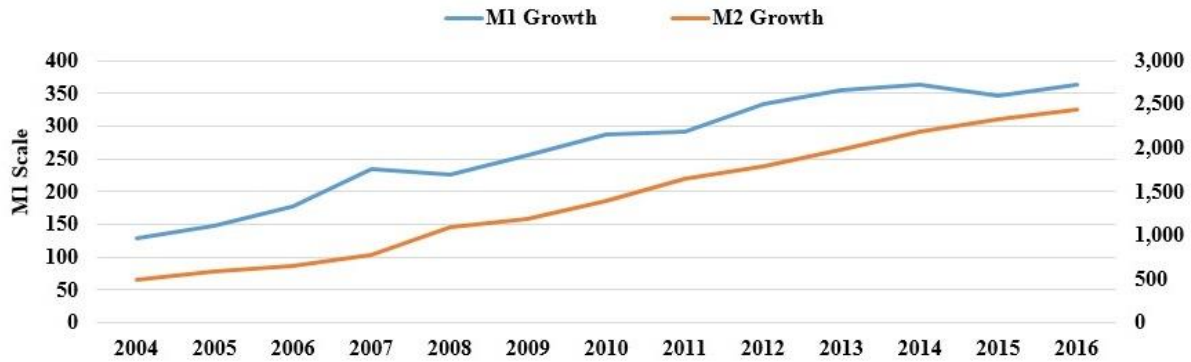
Money Supply

Monetary aggregates measuring the size of the money stock are defined in Brazil just as they are in the U.S. In other words, M1 consists of currency, checking accounts plus similar, and traveler's checks. M2 consists of M1 plus savings accounts, small time deposits, money-market mutual funds, and some minor savings vehicles (Mankiw, 2018, p. 324). The behavior of M2 after the reduction in the interest rate from 15.46 percent in 2006 to 12.15 percent in 2007 is notable. Table 6 below displays the compound-adjusted growth in M1 and M2 in each phase of the cycle. Figure 3 displays the continuous growth in both aggregates across the cycle.

Phase	Stage of Business Cycle	Time Period	Time Period	CAG M1	CAG M2	M2 Average (Phase 2 Only)
1	T-boom	Jan. 2004	Sep. 2008	15.34%	20.83%	
2	Reset	Oct. 2008	Dec. 2009	24.52%	12.15%	12.98%
	M-boom	Jan. 2010	Feb. 2014	8.54%	13.71%	
3	Bust	Mar. 2014	Dec. 2016	4.43%	7.27%	

Source: Central Bank of Brazil (BCB). M1 and M2 series 27791 and 27819, respectively.

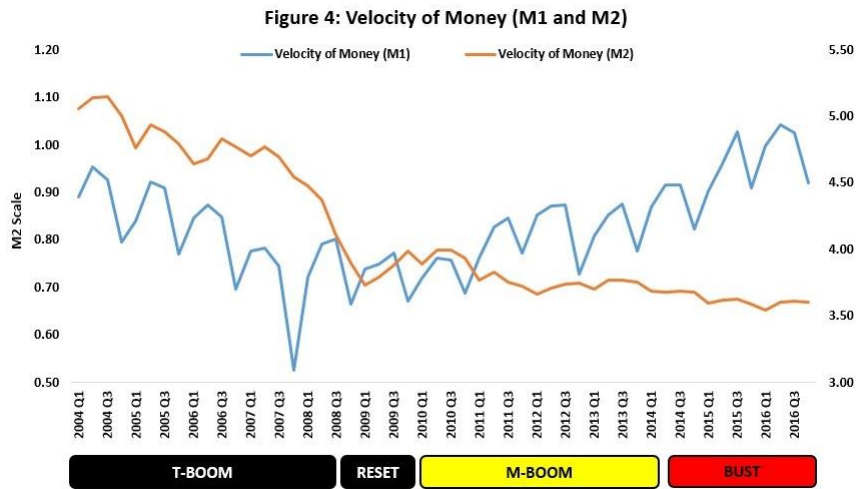
Figure 3: M1 and M2 Growth (Millions R\$)



The growth rate in M2 was 20.83 percent in Phase 1 and 12.98 percent (average, see Table 6) in Phase 2. Thus, it should be no surprise that the average nominal interest rate between these two periods fell 35 percent. More money means lower rates.

From Figure 1, recall the massive jump in real GDP from -0.1 percent in 2009 to 7.5 percent in 2010. Notable is that this massive swing came on the heels of a boost in M2 from R\$755,191 million in January 2008 to R\$1,068,178 million in January 2009, a stunning one-year increase in the money supply of 41.4 percent (Central Bank of Brazil 2019). (*R\$* is the symbol for the Brazilian real, the Brazilian currency unit.)

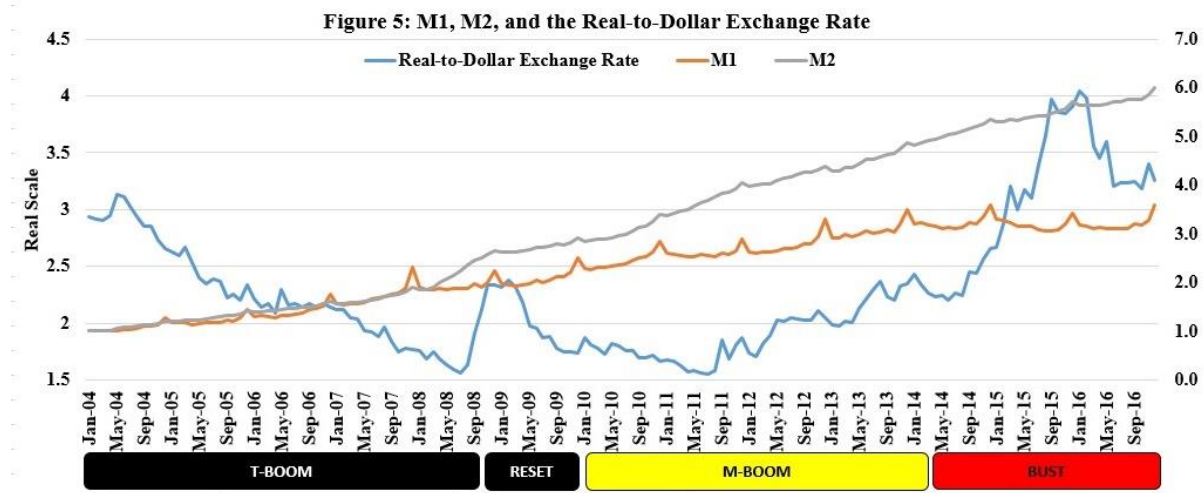
Velocity



In Figure 4 above are two different versions of velocity based on two different measures of the money supply, M1 and M2. What is stark in both graphs is a regime change in each. In late 2007 is a clear inflection point in the trend of M1 velocity toward the end of the T-Boom but before the beginning of the Reset. After that point velocity seems to be trending steadily higher. In all, the entire time series has a shallow "V" shape.

For M2, the "V" shape is much less pronounced but still visible. A steep downward trend commences at the beginning of the cycle before yielding to a second less steep downward trend. In a nice correlation with changes in real GDP, the inflection point of the regime shift falls slightly after the beginning of the Reset period. In light of the classical dichotomy and monetary neutrality, the trends in M2 suggest that the booms were significantly money driven and the prosperity during the boom periods illusory. What exactly caused the structural changes to occur at different times for M1 and M2 is a topic for future research.

Exchange Rate



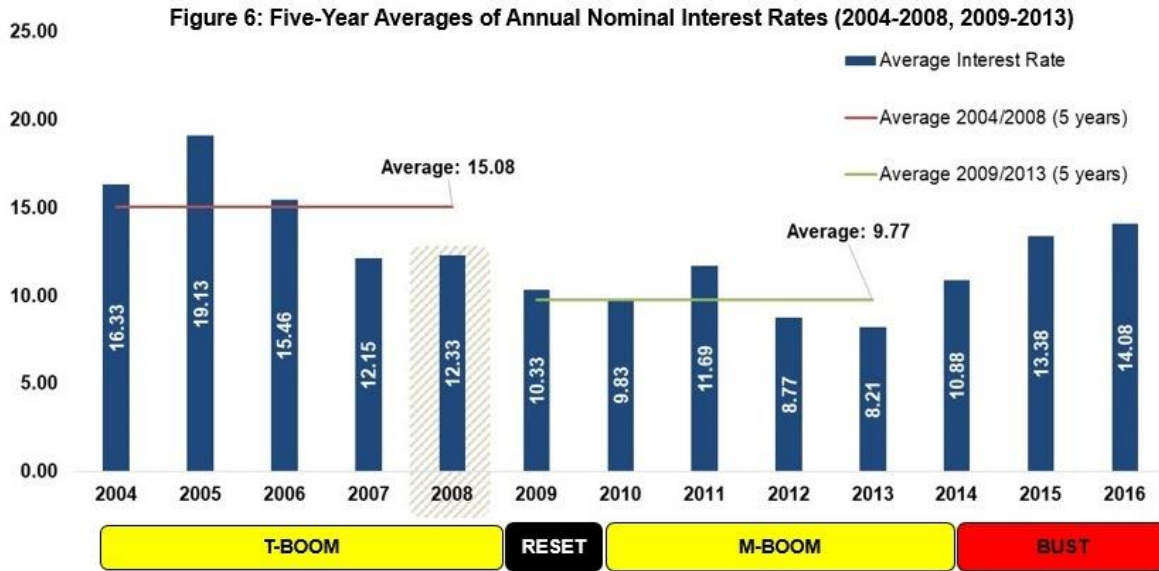
The data behind Figure 5 above show a clear and continuous appreciation in the Brazilian real from January 2004 (R\$2.94) to July 2008 (R\$1.57), a rise of about 46.6 percent. This corresponds almost exactly to the era of the T-Boom. From about August 2008 (R\$1.63) to February 2009 (R\$2.38) there was a depreciation in the real (about -46 percent). From there was an appreciation until July 2011 (R\$1.56, 34.5 percent). Then from there was a steady depreciation all the way to January 2016 (R\$4.04, -159 percent). From that point there was a steady appreciation until the end of the bust in December 2016 (R\$3.26, 19.3 percent).

Overall, the patterns displayed in Figure 5 seem to favor monetarism, particularly proposition 2: "the relationship between inflation and currency depreciation is not one to one. However, continuous inflation produces currency depreciation and continuous disinflation produces currency appreciation." While the appreciations over the Tripod, February 2009 to July 2011, and January 2016 to December 2016 periods seem to contradict the steady rises in M1 and M2 over the same periods, the "chickens come home to roost" in the August 2008 to February 2009 and July 2011 (R\$1.56) to January 2016 (R\$4.04) periods, especially the latter which is 54 months (4.5 years) of steady depreciation.

Second, in the bust, the Brazilian economy was afflicted with stagflation (stagnant growth plus inflation) that monetarism, with its room for lags between excess money creation and its adverse effects, tends to explain better than its competitors.

Interest Rate

Figure 6 below displays the annual nominal interest rate throughout the cycle. In Phase 1, the interest rate averaged 15.08 percent per annum. During Phase 2, the mean interest rate was 9.77 percent. This is a difference of 5.31 percentage points, a fall of 35 percent.

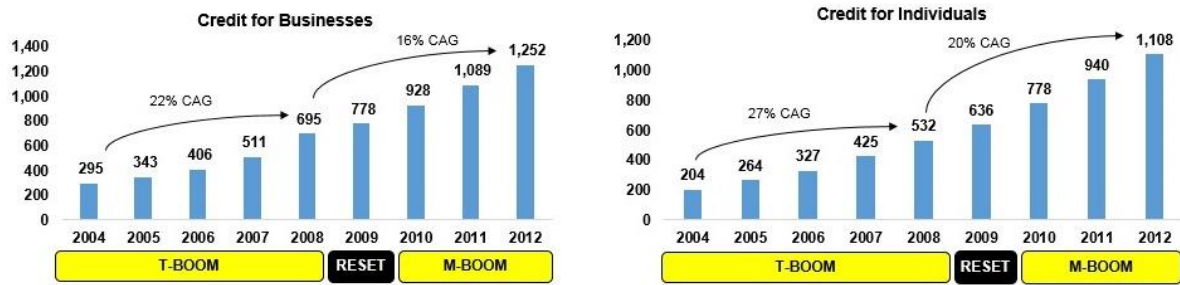


Since the real interest rate throughout the cycle displays the same pattern as the nominal rate and given current space constraints, the authors will not display it here.

Credit Expansion

Figure 7 below shows the growth of credit in the first two phases of the cycle. Displayed in the first graph (on the left) of Figure 7 is the growth pattern of business credit. It is composed of government and free-market credit for businesses. The average annual compound growth rate was 22 and 16 percent for Phase 1 and Phase 2, respectively. Displayed in the second graph (on the right) of Figure 7 is the growth pattern of credit for individuals. Note that the growth of credit for individuals is even higher than the growth of credit for businesses in Phase 1, reaching 27 percent (versus 22 percent for businesses). In Phase 2, there is an impressive 20-percent rate of continued growth in credit for individuals. Not surprisingly, the growth rates of credit in Phase 1 for both graphs (22 and 27 percent, respectively) are higher than their counterparts in Phase 2 (16 and 20 percent, respectively). While the declines were significant but not very large, they suggest diminishing returns to money creation as a credit stimulus.

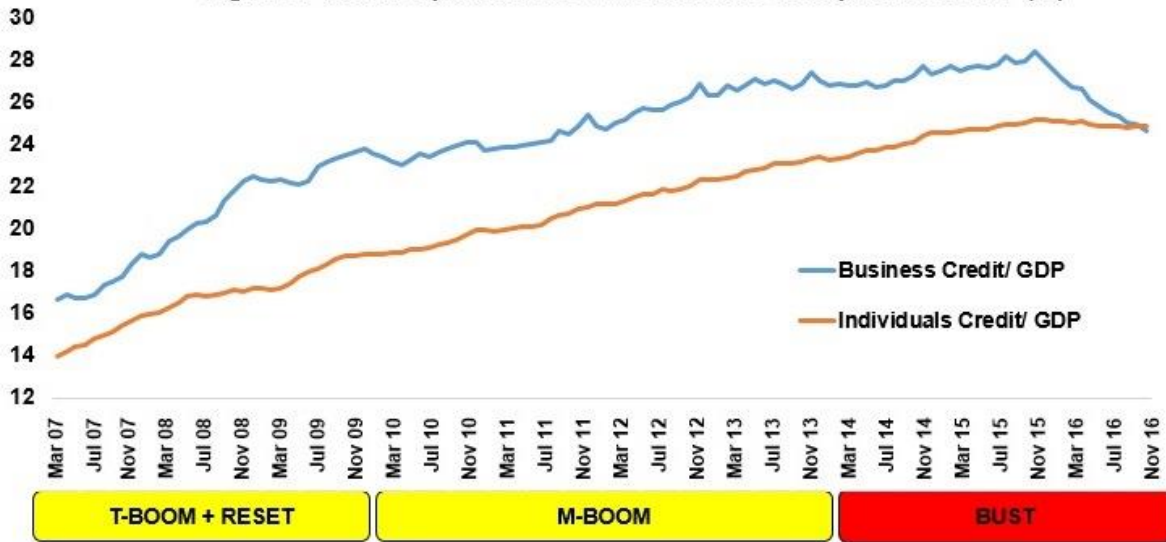
Figure 7: Credit Expansion for Businesses and Individuals (Billions R\$)



Source: data from BCB, elaborated by authors. The business credit series is a result of the sum of government credit policies for business (code 20021) and free-market credit for business (code 12128). For individuals, data were calculated using the sum of government credit policies for individuals (code 20020) and free-market credit for individuals (code 12127). The month of December of each year was used as a basis for the calculation. For the calculation of compound-average growth (CAG) in 2004, December 2003 was used as the starting point. The series were discontinued starting in 2012, which means that Phase 2 in the charts above is missing data for 2013.

Figure 8 displays business and individual credit as a proportion of GDP. Both variables rise steadily through both booms until leveling off and falling during the bust.

Figure 8: Credit Expansion and Contraction as a Proportion of GDP (%)

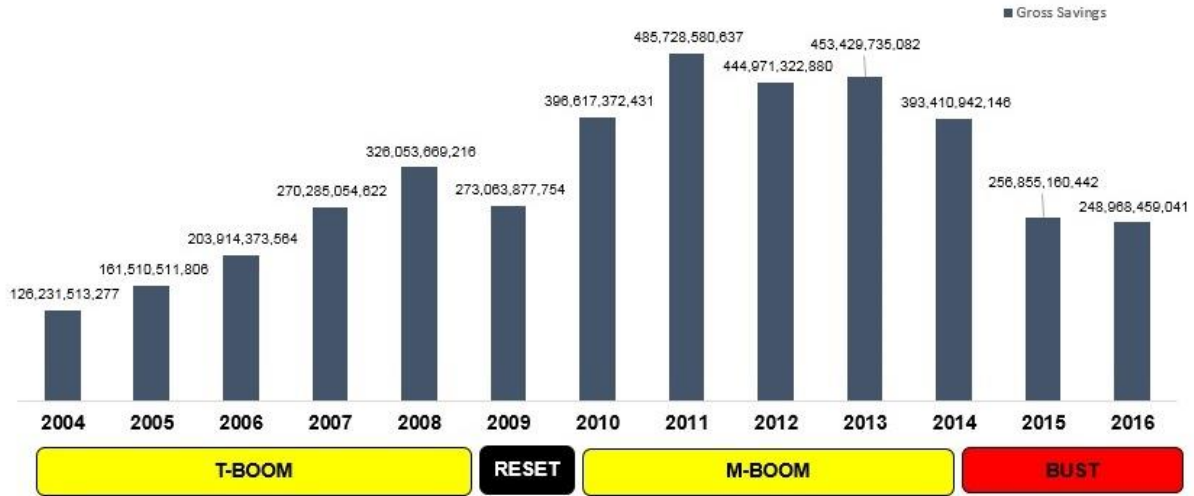


Source: Central Bank of Brazil (BCB). Business credit/GDP series 20623. Individual credit/GDP series 20624.

Savings

Figure 9 below displays yearly gross savings in current U.S. dollars throughout the cycle. As can be seen in the figure, savings rose in the Tripod boom but fell slightly in the Reset year of 2009. As the Matrix boom gained steam, savings peaked in 2011 and then fell slightly through 2014, then experienced a significant drop-off from 2014 to 2015 and 2016.

Figure 9: Brazilian Gross Savings in Current U.S. Dollars (2004-2016)



Source: World Bank, 2019. Gross savings in current U.S. dollars.

Industrial Production of Higher- and Lower-Order Goods

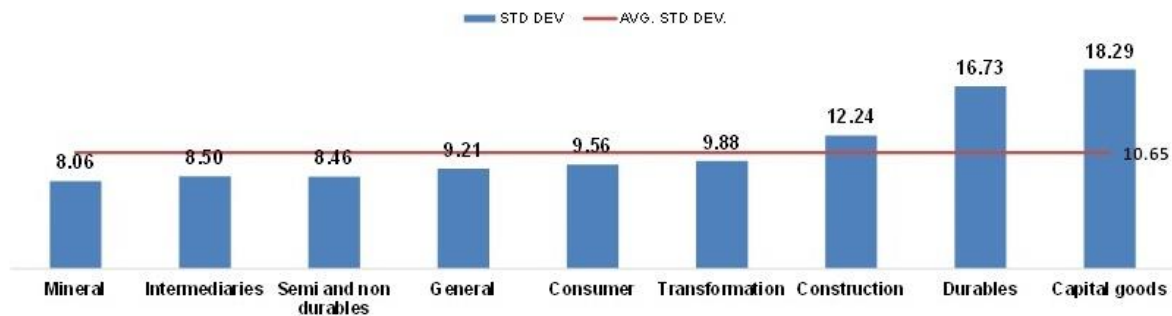
Capital/higher-order goods (e.g., machines) are used to make intermediate goods and final products. Final products (consumer/lower-order goods [e.g., tubes of toothpaste]) are eventually sold at the retail level. Lowering interest rates in the absence of voluntary savings will have different effects on higher- and lower-orders of production (Hayek, 1931a). Higher orders of production will have a higher variability or standard deviation (Rothbard, 2000, p. 9). Table 7 below displays the standard deviations of the different orders through Phase 2 (Matrix boom) and Phase 3 (Bust) of the Brazilian cycle.

Table 7. Industrial-Production Volatility for Phase 2 (Reset and M-Boom) and Phase 3 (Bust)				
Production Stage	Sector	STD DEV	MAX	MIN
Higher order	Minerals	8.06	115.00	71.80
Intermediary	Intermediaries	8.50	111.40	75.80
Lower order	Semi- and Non-Durables	8.46	116.00	78.70
-	General*	9.21	112.60	75.80
Lower order	Consumer	9.56	116.30	75.50
Intermediary	Transformation	9.88	113.70	73.70
Higher order	Construction	12.24	110.90	61.10

Higher order	Durables	16.73	119.30	54.70
Higher order	Capital Goods	18.29	127.10	51.60
* All sectors included.				

Figure 10 below reveals that three sectors were above average: Construction, Durables, and Capital Goods. These sectors were clearly the most volatile and represent 75 percent of the higher-order sectors.

Figure 10: Standard Deviation of Industrial Production Among Sectors Phases 2 and 3: September 2008 to December 2016



Source: Central Bank of Brazil (BCB).

In sum, the results show that Brazil's higher-order sectors experienced the highest growth in Phase 2 and the steepest decline in Phase 3 (the bust) compared to lower-order sectors of production. The one outlier sector is Mineral. Very briefly, this sector is an anomaly because first, its iron-ore subsector is characterized by an unusually high level of export sensitivity. Second, its Petroleum and Natural Gas subsector is subject to extensive government controls which, in this instance, inadvertent as it was, helped it avoid an artificial boom and crash.

MONETARISM AND ABCT IN LIGHT OF THE EMPIRICAL EVIDENCE

The observed facts from the recent Brazilian experience, when compared with monetarist predictions, are as follows.

Table 8. Monetarism Versus the Empirical Evidence				
Variable	T-boom and M-boom	Observed?	Bust	Observed?
Real GDP (<i>Q</i>)	Positive rate of growth (by definition).	Yes, positive rate of growth (Figure 1).	Negative rate of growth (by definition).	Yes, negative rate of growth (Figure 1).

Price level/Inflation (P)	Rises, falls, or remains constant (Equation of Exchange).	Yes, rose and fell (Figure 2).	Rises, falls*, or remains constant* (Equation of Exchange).	Yes, rose and fell (Figure 2).
Money supply (M)	Rises, falls*, or remains constant* (Equation of Exchange).	Yes, rose (Figure 3).	Rises, falls*, or remains constant (Equation of Exchange).	Yes, rose (Figure 3).
Velocity (V)	Stable.	Yes, stable in gradual rise or fall (Figure 4).	Stable.	Yes, stable in gradual rise or fall (Figure 4).
Exchange rate	Loosely rises or falls with the money supply (proposition 2).	Loosely rose with sustained rise in the money supply (Figure 5).	Loosely rises or falls with the money supply (proposition 2).	Loosely rose with sustained rise in the money supply (Figure 5).
Interest rate (nominal)	Rises, falls, or remains constant with expected inflation (proposition 2).	Yes, fell (Figure 6).	Rises, falls, or remains constant with expected inflation (proposition 2).	Yes, rose (Figure 6).
Credit expansion	No prediction.	Not applicable.	No prediction.	Not applicable.
Savings	No prediction.	Not applicable.	No prediction.	Not applicable.
Industrial production of higher-order goods	No prediction.	Not applicable.	No prediction.	Not applicable.
Industrial production of lower-order goods	No prediction.	Not applicable.	No prediction.	Not applicable.
*Possible but highly unlikely scenarios given central-bank norms.				

Table 8 above reveals that 12 out of 12 (100 percent) of applicable expected results from monetarism were confirmed by the data. The observed facts from the recent Brazilian experience, when compared with ABCT predictions, are as follows.

Table 9. ABCT Versus the Empirical Evidence				
Variable	T-boom and M-boom	Observed?	Bust	Observed?
Real GDP	Positive rate of growth (by definition).	Yes (Figure 1).	Negative rate of growth (by definition).	Yes (Figure 1).
Price level/Inflation	Rise	Yes, over the long term (Figure 2).	Stable or lower	No, rose and fell (Figure 2).
Money supply	Rise	Yes (Figure 3).	Fall/ Stagnate	No (Figure 3).*
Velocity	No prediction.	Not applicable.	No prediction.	Not applicable.
Exchange rate	No prediction.	Not applicable.	No prediction.	Not applicable.
Interest rate	Fall	Yes (Figure 6).	Rise	Yes (Figure 6).
Credit expansion	Rise	Yes (Figure 8).	Fall	Yes, eventually (Figure 8).
Savings	Stagnate, fall, or rise less than credit expansion	No, rose ~158% 2004-2008, ~14% 2010-2013 (Figure 9)	Rise	No, fell (Figure 9).
Industrial production of higher-order goods	Rise more than lower orders	Yes, except for one sector (Table 8 and Figure 10).	Fall more than lower orders	Yes, except for one sector (Table 8 and Figure 10).
Industrial production of lower-order goods	Rise less than higher orders.	Yes (Table 8 and Figure 10).	Fall less than higher orders.	Yes (Table 8 and Figure 10).
*See CAG for M2 in Table 6 above. While the growth rate of M2 was not negative it was on average a little more than a third of what it was in Phase 1.				

Table 9 above reveals that 12 out of 16 (75 percent) of applicable expected results from ABCT were confirmed by the data. The variables that fell outside expectations were price level/inflation, money supply, and savings.

CONCLUSION

This paper intended to analyze the 2004-2016 Brazilian business cycle through the lens of monetarism and Austrian Business Cycle Theory (ABCT). For monetarism, 100 percent of its expected results were confirmed by the data, for ABCT, 75 percent of its expected results were confirmed. Now that the tenets of each model have been sufficiently delineated and examined along with the raw data, the authors can now statistically test the propositions unique to monetarism to further confirm its validity as the optimal paradigm for the Brazilian business cycle(s) occurring in 2004 and 2016.

No doubt some impatient researchers will consider the type of precursory work found in this paper too simple and mundane and thus an "unnecessary step" in research methodology. They may do well to learn or rediscover that careful preparation in any research can end up being a very necessary step to avoiding embarrassment, false hope, and unnecessary labor.

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