Juglar's Credit Cycles

Jürg Niehans

Types of Cycles, 1860

By 1860, middle-aged Frenchmen, Englishmen, or Americans had experienced, during their lifetimes, four serious business crises. These disasters had long been one of the principal topics of economic debate, and most of the major approaches to a theory of business cycles had already been conveyed to print, if only in vague outline. According to the oldest approach, financial panics represented the bursting of speculative bubbles, each initiated by some fortuitous historical event, but all having the same basic mechanism with irrational expectations at its core. Crises were like meteors: they hit at random and with unequal force, but each left a crater of the same kind. John Law's Mississippi bubble of 1720 was regarded as the prototype of this sort of crisis. Toward the end of the classical era of political economy, this approach was favored by both the Banking School and (after the Banking Act of 1844 had failed to prevent crises) the Currency School. Overall, however, it was in eclipse. After all, crises had occurred in 1825, 1836, 1847, and 1857. This suggested periodicity, at least of an approximate sort, and the ten-year cycle had become a commonplace notion. For such periodicity, the random-bubble approach offered no explanation.

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Its place was taken by the hypothesis that the recurrence of crises was not due to historical accident, but part of the mechanism itself. Some writers thought that the fluctuations were imposed on the economic system by some outside force. The alternation between good and bad harvests was the most obvious candidate. William Petty, taking the harvest cycle for granted, argued that ordinary land rent should reflect yields over "the *medium* of seven years, or rather of so many years as makes up the Cycle, within which Dearths and Plenties make their revolution" (1963, 43). Eugen von Bergmann, in his still-useful history of crisis theories, reports the opinions of the French farmer Briaune who thought that modern business cycles were the continuation of the fourteen-year harvest cycle revealed to Joseph in his Egyptian dream (1895, 230–40). The best-known protagonist of this approach was William Stanley Jevons with his sunspot hypothesis (1884, 194–243), but its adherents, although including economists like Herbert Stanley Jevons and Henry Ludwell Moore, remained few.

According to a third conception, the economy is a system that responds to disturbances, periodic or not, with dampened vibrations characterized by a certain "eigenfrequency" of, say, ten years. A rocking horse is the often-used metaphor. Jevons toyed with this hypothesis as well, but he dismissed it as "rather fancyful" (1884, 226), and it played no role in the second half of the nineteenth century. Decades later, it was forcefully revived by Wicksell (1953) and Ragnar Frisch (1933) and became the dominant approach around the middle of the twentieth century.

A fourth type of oscillation is most easily illustrated by a frictionless pendulum. In this case, the economy is assumed to be constructed in such a way that starting from initial conditions, it will repeat the same oscillations forever. The collapse of 1929, like that of 1873 or 1825, is due to some original disturbance, perhaps the expulsion from paradise. This type of theory developed from late-classical notions about the periodic conversions of circulating capital into fixed capital. It received a powerful impulse from post-Marxian developments of Marxian ideas around the turn of the century, and later found its purest expression, given a proper choice of parameters, in the accelerator-multiplier models of Michal Kalecki (1935) and Paul Samuelson (1939).

There is yet a fifth type of oscillation. Michael von Tugan-Baranowsky (1901, 251) illustrated its mechanism by a steam engine in whose cylinder the continuous pressure of the steam is transformed

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into the reciprocating motion of the piston. Another illustration of this type is the pile driver whose ram, lifted by continuous air pressure, is periodically released. This type of relaxation oscillation was suggested by extensive empirical research to Clément Juglar. The differences between the various approaches should not be overdrawn, though. Today, with the advent of chaos theory, we realize that successive periods of history, even if they were generated by the same model, might resemble different types of more-or-less regular oscillations, perhaps separated by periods of seemingly random fluctuations.

Juglar's Life

Clément Juglar[1] was born in Paris on 15 October 1819. The son of a physician, he studied medicine, writing a noted dissertation on the influence of heart disease on the lungs, and then made a promising beginning as a practicing physician. Like Quesnay, he was often said to have been deeply influenced in his economic thinking by his physiological perspective. It is true that he occasionally used medical metaphors, such as the comparison of crises with fevers, but they do not go beyond the obvious figures of speech any layman might use. He even seems to have missed the description of periodic crises as the "pulse" of growing economies (of which lawyer Schumpeter later was so enamored [1939, 2:463]). It is difficult to detect in Juglar's economics any specific contribution from his medical training. The main point here is that he had the mind of an empirical scientist.

Though Juglar retained a lifelong interest in medical problems, his research, perhaps under the influence of the revolution of 1848, gradually shifted to social problems. Together with Malthus and Wicksell, he forms a triumvirate of great economists who were led to economics from the study of population. Investigating the determinants of birth rates, mortality, and marriages, he was impressed by the pervasive influence of economic conditions. The fluctuations in these conditions became the leitmotiv of his life. His prize-winning book on business cycles and his numerous contributions to statistical and economic journals, all on cycles, credit, and central banks, made him one of the prominent French economists and statisticians of his day. In 1860, he was one of the founders of the Société de Statistique and later its pres-

1. The main sources for this section are de Foville (1905) and Beauregard (1909).

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ident, and he was also president of the Société d'Economie Sociale. In 1892, he was elected to the Academy of Moral and Political Sciences (as the successor of Courcelle-Seneuil). A further book, *On Exchange and the Freedom of Issue* (1868), although it also won a prize from the Academy of Moral and Political Sciences, did not leave a mark in the history of economics.

Juglar taught statistics at the Ecole Libre des Sciences Politiques, but, like most of the great French economists, he never belonged to the Paris university establishment. For the most part, he seems to have led the life of an independent scholar and financier, earning millions of (gold) francs by applying his expertise in the financial markets. He nevertheless remained a man of simple tastes, who valued his fortune mostly as successful proof of his theories. He was liberal in his economic views, a conservative family man in his values, and a devout Catholic who was instrumental in the foundation of an annual mass for the souls of defunct members of the Institut de France. De Foville (1905) described him as "a man of character, of heart, and of faith" (298) and a highly cultivated friend of the arts. Juglar died in 1905.

Des Crises Commerciales

With laborious efforts, Juglar assembled an extensive "data base" of banking statistics, which became his main research tool. Early results of his investigations were published in successive articles in the *Journal des Economistes* (1851, 1852, 1857) and the *Annuaire de l'économie politique* (1856). Juglar came to the conclusion that business conditions do not simply reflect exogenous influences like good and bad harvests, or wars and epidemics, but also a cyclical mechanism inherent in economic life itself. This mechanism he found most faithfully expressed in the volume of central bank discounts. With pride, he later pointed out that the balance sheets of the Banque de France had permitted him to forecast the crisis of 1857 six months in advance. Broadening his perspective, he found virtually identical cycles in the balance sheets of British and American banks of issue. From this emerged his main theme, as summarized in the ringing sentence that concludes his principal work. This work was meant to suggest, he wrote, "to those who have too much confidence in the future of prosperity, *prudence* in view of the inevitable crisis, together with the *means* to *calculate its approach;* to those who are overly discouraged

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by the sufferings of the crisis, the hope of a future *recovery* that is no less certain; to those who use and distribute that formidable but fragile power of credit, *moderation,* which makes it more stable, and *energy,* which supports it; to all those who are interested in the history of nations, a means that would *explain* many historical facts and might in the future, so we hope, if not *suppress,* then at least *mitigate* those terrible disasters which are called *commercial crises"* (1889, 556; all quotations from this work are this author's translations).

In 1860, the Academy of Moral and Political Sciences announced a competition for a study on the causes and effects of commercial crises in Europe and North America during the nineteenth century. It was as if it had been made to order for Juglar, and his essay was awarded the prize. The study was published, revised and slightly extended, under the title (in translation) *Of Commercial Crises and Their Periodic Return in France, England, and the United States* (1862). The title promised more than the little book delivered. A more accurate title would have been "Bank Discounts and Reserves as Indicators of Business Cycles," because the essay was essentially limited to a detailed chronicle of crises as reflected in bank balance sheets, with a few fragmentary statistics from other sources and very little economic analysis. In particular, Juglar traced the development of the following balance-sheet items: 1) discounts and advances, 2) metallic reserves, 3) note circulation, 4) deposits and current accounts (1862, 3). Whereas items 3 and 4 turned out to move somewhat irregularly, items 1 and 2 were discovered to be highly revealing. "What at first appeared as merely incidental," Juglar explained, "turned out to be the principal and dominating factor. Banking operations, the extension and contraction of discounts, the abundance or scarcity of means of payment, . . . had as their consequence the profound modifications one observes in population movements, in trade, imports and exports, in revenues, direct and indirect taxes, and finally in public credit, which is well represented by the price of government issues on the stock exchange" (ix). Economic fluctuations originate in the credit system.

Juglar's main points can be summarized as follows. 1) Whereas other writers examined each crisis separately with respect to its particular causes, he proposed examining the sequence of crises as a whole with respect to their common cause (iii–v). 2) This reveals business cycles as endogenous and repetitive. 3) The most faithful indicators of business cycles are bank discounts and metallic reserves; since

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they are leading indicators of general business conditions, they can even be used for forecasting (3, 197–98). 3) Banking operations are identified as the cause of fluctuations in foreign trade, prices, inventories, population movements, and public finance (ix). The very repetitiousness of Juglar's chronicle was supposed to make these propositions more persuasive (1862, xii; 1889, 10).

In the following decades, Juglar continued, extended, and updated his work. In the second edition of 1889, the book had grown to almost three times its original size, from 253 smaller pages to 556 larger pages. Time-series graphs were appended in numerous folding tables. The slender study of bank balance sheets had developed into a massive treatise on business cycles. The content was finally living up to the title. At the same time, the exposition had become prolix, repetitive, and discursive. De Foville reported that Juglar came to regret the book's excessive size and planned to cut it back in a third edition. The complete book was never translated into English, but excerpts were translated and heavily edited by DeCourcy W. Thom (Juglar 1966).

One of the main additions to the second edition is the empirical evidence from three further decades of business-cycle history. By and large, Juglar could justly claim that this evidence fully confirmed his earlier views. Few business-cycle analysts could have said as much after twenty-nine years. A typology of successive phases of the business cycle was also added. In addition, prices and their interaction with bank credit were now assigned a dominant role in the cyclical mechanism. In fact, in the first edition, Juglar's theory of the business cycle was vaguely sketched at best, and one has to go to the second edition to discern an outline of the basic mechanism. It is hard to defend the view, therefore, that the second edition added nothing significant to the first. While the decisive date for Juglar's intellectual contribution is 1860, only the second edition earned him a statue in the pantheon of economic science.

Juglar convinced economic science that advanced economies inherently develop in cycles. In this sense, he may be called the progenitor of the business cycle. He was far from being the first to suggest that crises are repetitive. Thomas Tooke and Lord Overstone, to mention only two, had done this before him, and Juglar also refers to Cobden. Nor did Juglar introduce the term "cycle." He did use it (1889, 17, 97, 162, 166, 554), but only infrequently, and not in a specific analytical sense. Where we would speak of cycles, he usually talked about peri-

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odic crises. The remarkable fact, for a modern reader, is not that he occasionally used the word, but that he largely managed to avoid it. In substance, however, Juglar may justly be credited with having "created" the business cycle, in the sense that he persuaded the profession of its existence, persistence, and pervasiveness. For at least a century after his pathbreaking work, the cycle he had identified was regarded as one of the most fundamental problems of economic history, economic policy, and economic science.[2]

Distilling Theory from Facts

Juglar purported to present a "theory" of business cycles. His conception of a theory, however, was that of an ingrained empiricist. It was the conception of the German historical school, then in its heyday, and later of the American Institutionalists, and of the National Bureau of Economic Research.[3] According to this conception, crudely formulated, the scientist first has to collect facts. He then lets these facts "speak for themselves," and from what they say, he eventually distills scientific "laws," his "theory." "Without having recourse to any theory, any hypothesis," so Juglar claimed, "the observation of facts alone was sufficient to reveal the laws of crises and of their periodicity" (1889, xv). Overall, historicism did not enrich economics with many laws of lasting validity; its net contribution to mainstream economic theory has been small. Juglar's business cycle was probably the largest single contribution of historical empiricism to mainstream economics. Ironically, its originator was not a German professor but a French physician.

The core of Juglar's data base consisted of monetary and banking statistics for England, France, and the United States, reaching back to the end of the seventeenth century. In the 1889 edition, the data also included extensive price series, some foreign trade statistics, and as-

2. In 1967, Martin Bronfenbrenner chaired a conference on the question, "Is the business cycle obsolete?" (Bronfenbrenner 1969). The answer at that time was "no," but the following decades were marked by increasing doubts about whether Juglar's cycle was not perhaps an optical (or, more exactly, a statistical) illusion after all.

3. In fact, Wesley Mitchell's first massive volume on business cycles (1913) bears a striking resemblance, in both the selection and the presentation of material, to Juglar's 1889 edition. This is all the more remarkable since Mitchell was not visibly influenced by Juglar. He only referred to him in passing as a source for historical material about the 1870s, and in his survey of business cycle theories he did not mention him at all.

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sorted data on wages, on production, consumption and inventories of various commodities, and also on transportation and public finances. The procedures were essentially the same as those later elaborated by Wesley Mitchell and the National Bureau of Economic Research. The first step is dating the crises, which in Juglar's graphs were already marked by shaded bands. The result is a rudimentary reference cycle. The individual time series are then related to this reference cycle. The basic observation is that statistical data "exhibit series which succeed each other alternatively in one direction or another" (1862, 7; 1889, 10) or, in modern terminology, serial correlation. It is, therefore, possible to distinguish between periods with predominantly upward movement and others with predominantly downward movement, separated by peaks and troughs.

The main indicator of prosperity and depression, for the Juglar of 1889, is the course of prices. "In all economic phenomena, prices thus always play the greatest role, both in prosperity and in a crisis" (87). More specifically, "there is no period of prosperity without a more-or-less continuous increase in the prices of the principal products, and it is always when the maximum has been reached that the crisis breaks out" (75). "On the eve of a crisis, after a large and persistent movement of business during a series of years, prices do not rise any more. On the eve of recovery, after a long stagnation of business, prices do not decline any more" (11). This emphasis on prices continued to be a characteristic feature of business-cycle analysis for another half-century until prices were gradually replaced in their leading role by real output and its components. Adherents of new classical business-cycle theory may be tempted to interpret this fact as expressing the notion that prices are market clearing at all times. This is a questionable interpretation, because there is abundant evidence that even the most "neoclassical" business cycle theorists assigned important roles to involuntary unemployment, unwanted inventories and the stickiness of prices and wages. In Juglar's case, the emphasis on prices mostly reflected the simple fact that price series had already become relatively plentiful, whereas quantity data were rarely available and national income accounts were nonexistent.[4]

Price fluctuations, once established, were compared to other series. Most of these were procyclical, but some of them, of course, turned

4. The same reason has been given by J. N. Wolfe (1956, 97) in partial explanation of Alfred Marshall's concentration upon price movements.

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out to be countercyclical (1889, 11). The turning points can be compared to identify, in later terminology, leading or lagging indicators, and the former can perhaps be used for forecasting (554, 10). By far the most informative of these series are said to be those of bank discounts (procyclical) and bank reserves (countercyclical), which Juglar presents in great detail. They provide the most reliable business "barometer" (168, 291) and are the main leading indicators (1862, 3). While Juglar's procedures anticipate many of the concepts later developed by the National Bureau of Economic Research, his statistical techniques were primitive. He was content to judge the trend of a fluctuating series by its annual maxima and minima. He did not possess Jevons's talent for econometrics, nor did he master the art of presenting descriptive statistics in an illuminating way.

In Juglar's view, the facts demonstrated conclusively that the business cycle is inherent in the growth of advanced economies. This was his basic "law." "The periods of prosperity, crisis, and liquidation," he said, "do not result from a random throw of the dice; rather they result from the behavior, the activity, and particularly the savings habits of people, and from the use they make of the capital and credit at their disposal" (1889, xix). He even conjectured that growing wealth would be associated with an increasing amplitude of cycles (21, 44–45, 255). Cycles were the price of growth, and the price was well worth paying. Measures to suppress the cycle, therefore, might actually halt growth itself, but a better understanding of cycles would automatically lead to a mitigation of crises.

In the typical cycle, Juglar distinguished three phases, namely prosperity, crisis, and liquidation (1889, 10–11, 16–17, 21). Such phases had been enumerated before, and Lord Overstone had listed as many as ten of them (1857, 31). In most cases (including that of Lord Overstone), such distinctions are entirely arbitrary and analytically meaningless. In Juglar's case, this is not so. The important feature of his scheme is its asymmetry. Prosperity is a prolonged gradual expansion, properly regarded as the normal condition of a growing economy. It would last several years, and sometimes Juglar makes it as long as seven to nine years (1889, 91, 244–45). The crisis is a steep, virtually vertical, drop of two to three weeks duration (247). Liquidation is a more-or-less flat segment at a low level, which lasts from two to four years and, in any case, is much shorter than prosperity (91, 247). His oscillations, therefore, do not have the symmetrical shape of sine curves,

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but rather the asymmetrical shape of ocean waves as they roll toward the shore. In his view, prosperity is associated with some sort of slowly increasing tension, which is suddenly relaxed in the "explosion," as he called it, of a crisis. He also stressed the fact that the phases always follow each other in the same order, which means, for example, that prosperity never merges into a flat plateau on a high level, later followed by a crisis.

Even in the title of his book, Juglar placed particular emphasis on the periodicity and regularity of crises. This idea, too, had been around for some time; it was a commonplace notion. At the time Juglar began to look at economic problems, many writers had suggested a period of about ten years. In his case, it is not clear what periodicity and regularity are supposed to mean. He specifically denies that the cycles are of equal length, and he criticizes Jevons for arguing that they are. In his table of crises in the nineteenth century, the shortest cycles have a period of three years and the longest cycle (not counting interruptions by war) lasts eleven years (61). Every cycle in every country is seen to be, to some extent, historically unique, and its length has to be explained in light of its particular features. Periodicity and regularity, it seems, do not mean more than inevitability.

Juglar's main message is that the cycles are inevitable precisely because they are inherent in the growth process itself. In the history of economics, Juglar is the great protagonist of the endogeneity of business cycles. He sharply criticizes those who, like Tooke and Jevons, explain business cycles by good or bad harvests, wars, or epidemics. Once the tension in the upswing has become high enough, some random event, perhaps even a relatively insignificant one, may set off the explosion, but in its absence another random disturbance a little later would have had the same effect (43). Schumpeter attributed to Juglar the phrase "the only cause of depression is prosperity" and he even called it the "famous sentence" (1954, 1124). Unfortunately, Schumpeter provided no page reference, and diligent searches in both editions of Juglar's book (including searches by Bonjour and Heller 1989) failed to discover the source. A similar sentence occurs, however, in Schumpeter's own *Business Cycles*, where there is a reference to "Juglar's formula that prosperity is the *cause unique* of depression" (1939, 139, n. 1). Juglar did say that crises have a "unique cause," but this cause was not prosperity, but the halt in price increases. "The principal, and one could even say the unique, cause of crises is the cessation of the

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rise in prices" (1889, 33). Schumpeter, in writing the *History,* may have misremembered his own sentence in *Business Cycles.* In any case, the history of economics is not about words, and, in substance, Schumpeter's phrase, though apparently not used by Juglar, is an accurate expression of the latter's thinking.

It would not be equally true to say that, in Juglar's opinion, the cause of prosperity is crisis and liquidation. This is because the long-term growth of the economy appears to be, from the point of view of business cycles, an exogenous motor. In this respect, Juglar's conception of the business cycle is closer to that of Schumpeter (1939), Hicks (1950), and Goodwin (1951) than to, say, the straight accelerator-multiplier models. The question is, by what mechanism the continuous pressure of economic growth is transformed into the intermittent outbursts of expansion, separated by crises.

The Mechanism of Cycles

The answer is found mainly in the banking system: "With all peoples, in all eras, commercial crises were always accompanied by monetary crises" (1889, 13; see also 29). Business cycles, for Juglar, are a concomitant of a developed credit system: "The institution of credit alone thus leads, by its abuse, to the commercial crises" (47; see also 51), and "credit is the primary and principal motor of this whole mechanism" (75; see also 51). Forward markets play the same role as credit. Thus, Juglar became the great protagonist of the credit cycle. About the associated shifts in the composition of the capital stock, he had little to say. Others, including Lord Overstone and John Stuart Mill, claimed to have found an essential aspect of crises in what they called the conversion of circulating capital into fixed capital (Overstone 1857, 490, 544, 572–73, 590; Mill 1857, 2:304–6; book 4, chap. 4, para. 61), and unfinished railroad tracks lent plausibility to their argument. Juglar did not contribute to this line of analysis, leaving this task to the generation of Tugan-Baranowsky, Spiethoff, and Aftalion. Looking backward, the capital-imbalance theories seem to have faded away (though not necessarily forever), but credit cycles are still with us.

It would not be correct to call Juglar's explanation of business cycles a monetary theory, though. Like Henry Thornton and Thomas Tooke, Juglar was, in later jargon, a Radcliffian who played down the role of the quantity of money and emphasized the role of bills of exchange and

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credit in general (1889, 50). The Currency School is criticized for overestimating the significance of currency and bank notes. An increase in the quantity of bank notes is largely the *consequence* of rising prices rather than their cause (70). The velocity of money is considered highly variable over the cycle, being high in prosperity and low in depression (68). Though all credit, with a convertible currency, is ultimately anchored in gold reserves, the anchor cable is highly elastic, its length depending on the state of confidence. Banks are not mere intermediaries; they can create money because deposits can be used at the same time by both the bank and its customers (52). Like Thornton, Juglar thus regards the banking system as potentially unstable, subject to prolonged expansions and sudden contractions. Contrary to what adherents of the Banking School were inclined to argue, the maintenance of convertibility was not enough to prevent crises.

Juglar's financial mechanism is similar to the Thornton-Wicksell cumulative process, but supplemented by a foreign-trade component, a golden brake. The gold standard plays an essential role in Juglar's theory. In prosperity, confident banks tend to extend relatively easy credit, unworried about the gradual decline in their liquidity. As a consequence, prices rise. This gradually reduces the country's competitiveness in foreign markets. Sooner or later, the goods coming to market can no longer be sold at the expected prices. Inventories begin to accumulate, and the demand for credit increases precipitously; prices cease to rise. At the same time, the growing import surplus produces an external drain of gold reserves. Banks, therefore, are unable to satisfy the additional demand for credit. The crisis breaks out in the form of financial panic with skyrocketing interest rates (30–36). Juglar makes it clear, however, that crises cannot simply be attributed to the defensive measures of banks. Banks undergo crises; they do not cause them, he maintains. The crisis is rather initiated, even before banks have taken defensive measures, by the retardation of price increases and the stagnation of wholesale trade (32, 34). After the crisis, the overblown credit structure is gradually liquidated, prices fall back even below world-market levels, confidence returns, and the stage is set for a new upswing. The crucial element in the mechanism thus seems to be (as it is later for Irving Fisher) the inertia of interest rates during prosperity and the persistent tendency of bankers to be late in their upward adjustment, which Juglar explains by their lack of understanding of the crisis mechanism (35; see also 58). Irrational expectations, here too, play an essential role.

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Juglar places great stress on the international synchronization of business cycles. At first, this may seem to involve a contradiction, because it is obviously impossible for all countries to lose gold reserves at the same time (as noted in Bonjour and Heller 1989). The contradiction is easily resolved, however, by noting that synchronization is meant to apply to advanced countries only. Price increases in the advanced countries are indeed transmitted to other countries, but only with a lag. The business cycle would thus be associated with gold flows between the three advanced countries and the rest of the world (Juglar 1889, 33). This raises the question of whether a closed economy would also experience business cycles. Juglar provides no explicit answer. He would probably have pointed out that an internal gold drain could have the same effect as an external drain. He might also have argued that prosperity, in view of diminishing returns, is characterized by increasing marginal costs. In addition, the stimulating effect of rising prices may be lost once the rise is generally expected, so that prosperity merges into stagflation. Although these arguments would have been well within the tradition of monetary theory, Juglar did not put them forth.

The main theater of crises is the financial system; yet, Juglar notes a number of modifying factors of a "real" nature. Thus, he observes that raw-material prices are more volatile than wholesale prices (96), which in turn are more volatile than consumer prices, but he does not appeal to this shift in relative prices to explain the glutting of markets.[5]

A second modifying factor is innovation. The crisis closes the gate for new projects. Once the liquidation has progressed far enough, however, there is an abundance of capital for new investments. This is the point at which the innovators appear with their projects; everything is now regarded as promising enough by a credulous public (30, 37). Juglar left it to Schumpeter to elaborate on this aspect, but the basic idea was there. For Juglar, the credit cycle is primary, and the waves of innovations are secondary; for Schumpeter it is the other way around. It is not clear whether the difference is small or large.

5. A few years later, Thomas Nixon Carver proposed to base a theory of the business cycle on a "general law" to the effect that "the value of producers' goods tends to fluctuate more violently than the value of consumers' goods" (1903, 498). This was sometimes described as an early formulation of the acceleration principle. It was clearly nothing of the sort, and, furthermore, based on faulty reasoning. Carver's note is interesting, however, for drawing attention to the cyclical significance of gestation lags, which was later elaborated by Aftalion.

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A third observation of potential significance relates to consumption. Juglar notes that consumption expenditures fluctuate much less than incomes (117). Keynes's "fundamental psychological law" comes to mind (1936, 96). As a consequence, savings fluctuate more sharply than income, rising in prosperity and declining in depression. The counterpart is a rapid increase in fixed capital during prosperity, even though it is not yet used in production (Juglar 1889, 34). It would have been easy, so it seems, to extend the theory to incorporate fluctuations in the capital stock, but Juglar left this to others.

The last factor to be mentioned here is the (relative) rigidity of wages (117–21). In official statistics, Juglar notes, wages hardly ever decline; a superficial observer could conclude that they are rigid downward. In part, this is an optical illusion arising from the fact that wages have a strongly rising trend, which transforms cyclical declines into retarded advances. In part, the misleading impression is created by the fact that official statistics are based on published contract rates from which actual wages may differ in both directions. Actual wages indeed fluctuate with the business cycle, but much less than prices; workers are said to resist wage cuts. The counterparts of this relative wage rigidity are fluctuations in hours worked and unemployment. Unemployment was, therefore, associated with sticky wages in the period of victorious marginalism, just as in classical economics.

These observations on some "real" aspects of business cycles were suggestive and potentially important, but Juglar did not systematically build them into his theory. While this theory was not purely financial, it was predominantly financial. The main reason was not that Juglar regarded the "real" aspects as less important, but that, in his time, they were less amenable to statistical description. Once extensive production and income series became available, the scope of the theory could be expanded.

The Mechanism in Equations

Juglar's description of the cyclical mechanism reads plausibly enough. The key question for the modern theorist is whether the mechanism is indeed capable of generating endogenous oscillations. To answer this question, the description must be transformed into a model. Juglar was far from being a model-builder, but a modern economist may try to express the analytical core of his argument in equations like those

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following. They model the interactions between prices, p, gold reserves, G, and the margin between the bank lending rate, i, and the expected profit rate, r. Both p and G are measured as (positive or negative) deviations from their respective levels in the stationary state. The change in commodity prices, dp/dt, is assumed to be proportional to the margin between expected profits, r, and the bank lending rate, i, according to

$$dp/dt = r - i. \tag{1}$$

This is the Thornton-Wicksell element. The factor of proportionality is made equal to unity by choosing the appropriate units for p. The interest margin, in turn, is proportional to the banks' liquidity as measured by their gold reserve, G:

$$r - i = \beta G. \qquad \beta > 0 \tag{2}$$

With given r, the lending rate of banks will be lower, the higher their reserves, and *vice versa*. The change in gold reserves, finally, depends positively on the trade balance and so negatively on the level of prices. By choosing appropriate units for G, the relationship can be written simply as

$$dG/dt = -p. \tag{3}$$

Substituting for $r - i$ from (2) into (1), one obtains two interdependent differential equations in which the change in prices depends positively on the level of gold reserves, and the change in gold reserves depends negatively on the level of prices. This model turns out to be isomorphic to the Volterra-Lotka population model used by Paul Samuelson to derive a "universal" cycle of alternating dominance of two social classes (Samuelson 1972).

The cyclical behavior of this system can be visualized in the diagram in figure 1, where p and G are measured, respectively, along the two axes. Along the vertical $dp/dt = 0$ line, the gold stock is such that prices remain constant. To the right of this line, prices rise and to the left, they decline as expressed by the vertical arrows. Along the horizontal $dG/dt = 0$ line, the price level is such that the gold stock is constant. Above this line, the gold stock declines, and below it, the gold stock increases as expressed by the horizontal arrows. Starting from an arbitrary point, the system will follow an elliptic path in a closed circuit. Both prices and the gold stock will exhibit sinusoidal

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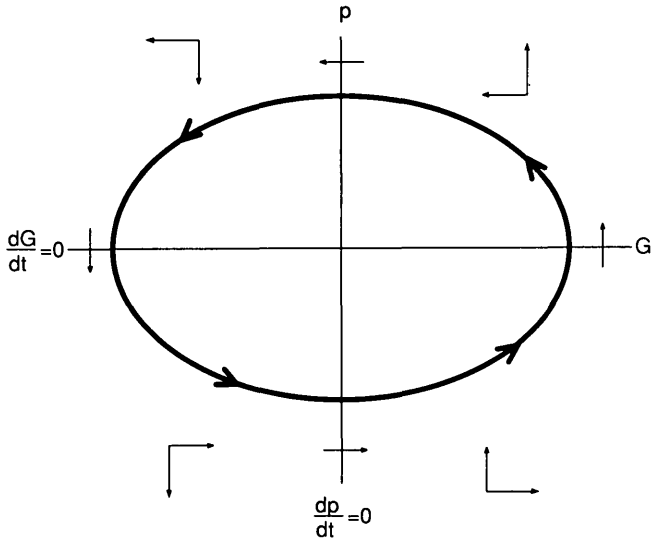


Figure 1

oscillations. In a more general model, the paths may be contracting or expanding spirals and the oscillations may be dampened or explosive. While such a crude model is far from doing justice to Juglar's much more complex analysis, it demonstrates that the core components of his theory are capable of generating cycles.

One essential aspect of Juglar's cycles is not reflected in this model. This is the fact that a crisis is not a gradual correction but a sudden collapse. This suggests that the symmetrical sine curves of the model are not an adequate representation of his thinking. What seems required is a model in which the crisis is marked by the abrupt transition to a different regime. In the early 1950s, John R. Hicks (1950) and Richard Goodwin (1951) analyzed nonlinear models of business cycles with an alternation between different regimes, but they focused on capital accumulation and not on credit. More recent models of speculative bubbles have not yet resulted in a theory of business cycles. It seems that Juglar's theory of the credit cycle, though its economic content has survived for more than a century, has never been explicitly modeled.

The reasons for the apparent discontinuity are nowhere explicitly stated by Juglar, but they seem to be related to the volatility of expectations. In particular, when prices during prosperity have reached a

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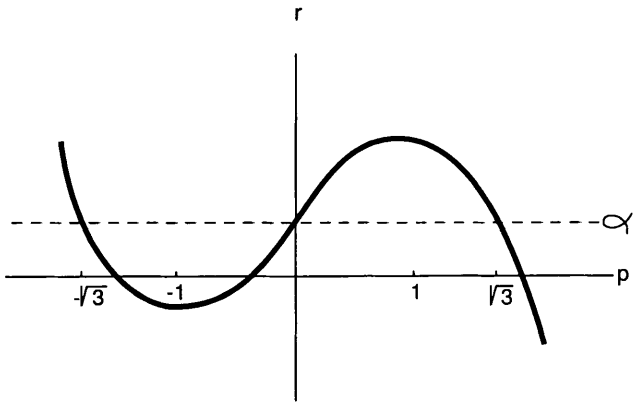


Figure 2

certain level, the decline in international competitiveness is said to cause a rapid loss of confidence. This idea can be incorporated in the preceding equations by relating profit expectations to prices. In particular, in some intermediate range of prices, expected profits should rise with rising p, but at some high level of p, r should begin to decline. At low levels of prices, on the other hand, further price declines, by improving international competitiveness, should improve profit expectations. This can be formalized by postulating

$$r = \alpha - \varepsilon(p^2/3 - 1)p. \qquad \varepsilon > 0 \tag{4}$$

Figure 2 shows how r depends on p. The central bank is still assumed to raise its discount rate whenever the gold stock declines and *vice versa*, but this is now expressed simply by

$$i = \alpha - G. \tag{5}$$

The constant α is supposed to reflect the rate of interest in the stationary state of $G = 0$. It would be rash to argue that this model is actually Juglar's. Mathematical reasoning was completely alien to his thinking, and he did not express himself with sufficient precision to permit an exact translation of his words into symbols. The preceding equations, though inevitably anachronistic, nevertheless seem to contain the basic relationships he had in mind.

By substituting from (4) and (5) into (1), this system can be reduced to two simultaneous first-order differential equations, namely (3) and

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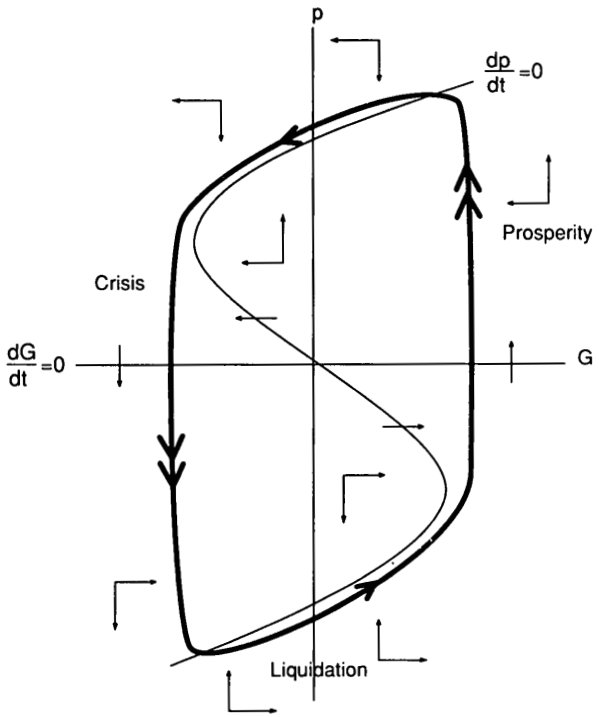


Figure 3

$$dp/dt = -\varepsilon(p^2/3 - 1)p + G. \tag{6}$$

By again differentiating (6) and substituting from (3), the path of prices can be described by the second-order differential equation

$$d^2p/dt^2 + \varepsilon(p^2 - 1)dp/dt + p = 0. \tag{7}$$

This happens to be the Van der Pol equation for relaxation oscillations whose exploitation for economic dynamics was suggested by P. Le Corbeiller (1933).

The working of this model is illustrated in figure 3 (see Mishchenko-Rozov 1980, 7, 10–13; Grasman 1987, 4, 26–28). Along the $dG/dt = 0$ line, identical with the horizontal axis, the gold stock is constant. At higher (positive) prices the gold stock shrinks and at lower (negative) prices it expands, as expressed by the horizontal arrows. Along the $dp/dt = 0$ curve, the price level is constant. At a higher gold stock prices rise, and at a lower gold stock they decline, as expressed by the

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vertical arrows. For appropriate values of ε, the system converges to the path drawn in a heavy line, where double arrows indicate phases with very rapid motion. Toward the end of prosperity, the gold stock declines and prices have passed their peak. In the crisis, prices fall almost vertically. During liquidation, with the increase in international competitiveness, gold reserves begin to recover, while prices, though again rising, remain low. With the return of prosperity, prices rise almost vertically at first. Gold reserves decline because of increasing trade deficits, and the cycle repeats itself. Through the use of a relaxation mechanism, it was possible to represent the asymmetry of prosperity and crisis on which Juglar put so much weight. Nevertheless, the model is still an imperfect representation of his thinking, because it suggests four distinct phases rather than Juglar's three. The upward "explosion" in prices during prosperity has no counterpart in Juglar's cycle. Further elaborations might bring the profile of the oscillations progressively closer to the shape of breaking ocean waves that Juglar had in mind. In particular, mathematical economists may be tempted to appeal to catastrophe theory, which has been offered precisely as a means to formalize asymmetric oscillations with slow rises followed by sudden collapse. However, the anachronistic modeling of older writers in terms of modern mathematics must have a limit, and the preceding efforts may already have passed it.

Influence, Recognition, and Achievement

Far into the nineteenth century, the banking and credit system was regarded as the main theater for economic crises. Juglar's endogenous credit cycle represents the culmination of this approach. His ideas became a part of many explanations of business cycles. A particularly clear example is the work of Ralph Hawtrey. In *Currency and Credit,* first published in 1913, the chapters on credit contraction and financial crises, though Juglar is not mentioned, read almost like a condensed summary of his views (Hawtrey [1913] 1928, 132–91). The same is true for Haberler's restatement of Hawtrey's "purely monetary" theory (Haberler 1937, chap. 2).

Juglar's visible influence on the development of business-cycle theory was small, though. Even before 1860, the attention of economists had begun to shift to the stock of capital goods. For John Stuart Mill and many of his contemporaries, the decisive factor was the periodic

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annihilation of fixed capital to counteract the decline of profit rates. The role of capital goods also became a convenient alibi for the failure of Peel's Banking Act in preventing crises. That political economy makes the expansion and contraction of credit, though mere symptoms, appear to be the cause of the cycle, was regarded by Marx as a sign of its superficiality (1890, 598). Later in the century, Marxian economists, like Tugan-Baranowsky, and Austrian capital theory became unlikely allies in the development of business-cycle theories focused on the structure of the capital stock. Credit became, for a while, a mere side show.

The work of Alfred Aftalion is representative of this shift in focus. His main ideas can be found in an early paper in the *Revue d'économie politique* (1909). The later elaboration in two volumes (1913) adds no essential elements. The core of the theory is a cobweb cycle for consumer goods. The crucial point is that output, in view of the long gestation lags of "capitalist" production, reacts to prices in both directions with a lag of several years. As a consequence, the path in which the system moves from an initial disturbance toward the new equilibrium is not monotonic but takes the form of violent alternations between prosperity and depression with a period of many years. The weak point of the theory is the lack of a satisfactory explanation of why aggregate demand for consumer goods should depend on their absolute money prices. Aftalion argued that this was due to the diminishing marginal utility of consumer goods as they become more plentiful, but this blunder only shows that he cannot have been a first-rate monetary theorist.

The relationship between consumer goods and capital goods is elaborated by the introduction of two modifying effects. One describes the secondary increase in consumer demand resulting from additional investment. Already clearly identified by Tugan-Baranowsky (1901, 238, 243), it is easily recognized today as a multiplier effect (Aftalion 1909, 73). The other effect describes the "reinforcement" or "augmentation" in the demand for investment goods resulting from an increase in consumer demand; the numerical examples identify it unambiguously as an accelerator (71–72). These are perhaps the most remarkable three pages in Aftalion's whole work. The credit market plays a secondary role throughout. While accelerators, multipliers, and gestation lags continued to dominate business-cycle theory, Aftalion could never explain, despite considerable effort, why gestation lags

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that differ widely between industries should produce a sustained general business cycle. The credit market offers a plausible control mechanism for the system as a whole. In the second half of the twentieth century, therefore, the credit market moved again to center stage, and the capital imbalances lost their dominating importance.

It is perhaps natural that an empiricist with little interest in pure theory had little immediate influence on the theory of business cycles. On empirical business-cycle research, on the other hand, Juglar's influence was decisive. A comparison with the monumental *History of Prices* by Thomas Tooke and William Newmarch is illuminating (1928). Its six volumes of facts and historical narrative are presented as if they were a pamphlet on current events, but Juglar marshalled his exhaustive data to answer scientific questions. From him to Wesley Mitchell and the National Bureau of Economic Research there was but a small step.

The recognition Juglar got from leading economists of the next generation was spotty. Marshall, though his explanation of business cycles had much in common with Juglar's,[6] did not list Juglar in the index of any of his books. Dennis Robertson (1948, 10, 211), mentions Juglar's "great work" only as an example of unwarranted concentration on monetary factors. There is no reference to him in Wicksell's *Interest and Prices* (1936), though his work would have been highly pertinent. Pareto, on the other hand, regarded Juglar's results as authoritative enough to take them as the basis for the section on business cycles in his Lausanne course (1896, 291–96).[7] Irving Fisher, too, regarded Juglar as an authority, particularly on the definition of crises (1911, 65), on the characteristics of prosperity (266), and on the statistical verification of the effect of deposits on prices (265–70). That he took Juglar's statistical findings seriously can be seen from the fact that he notes a point of disagreement. It is not correct, he notes, that rising prices are accompanied by falling interest rates (266).[8] Aftalion de-

6. For a summary of Marshall's views on cycles see Wolfe 1956.

7. The corresponding section in the *Manuel d' économie politique* (1927, 534–37) is just a brief summary of the earlier version.

8. In fact, Fisher misinterpreted Juglar. What Juglar had in mind was his observation, supported by extensive evidence (1889, 105–13, 121–41) that both discount rates and bond yields are low during (early) prosperity and high in the crisis (15–16, 128–29). He actually anticipated Fisher's argument that the inertia of interest rates was among the causes of cycles, and he even related the high level of discount rates during the crisis to the rapid rise in prices (16, 126) and to the margin between spot and forward prices (129).

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scribes Juglar's book as "valuable but rambling," and it is consistent with his capital orientation that he regards Juglar's analysis of saving as particularly influential (1913, 1:297–98). Mitchell, in his first book on business cycles, refers to Juglar only in relation to some events of the 1870s (1913, 46). It is characteristic of Juglar's slow rise to fame that fourteen years later, Mitchell calls him a distinguished pioneer whose work marks a critical turning point in the study of business cycles (1927, 10, 452).

The treatment of Juglar in the history of economics is similarly uneven. Again, a few representative examples must suffice. The only thing Charles Gide and Charles Rist had to say about their distinguished compatriot is that the monetary system had changed since his time (1947, 806). Lewis H. Haney describes Juglar as a pioneer in business-cycle research (1949, 855) who, however, was far from being the first to develop the thesis of regular expansions and contractions in economic life (671). Mark Blaug mentions, in a section on public works, that Juglar initiated systematic work on business cycles (1985, 672). Robert Ekelund and Robert Hébert (1990) make no reference to Juglar. Nor does he appear in the index of Haberler's authoritative book on prosperity and depression (1937), but this is undoubtedly due to the fact that this synthetic survey was not meant to be historically oriented. In T. W. Hutchison's *Review of Economic Doctrines: 1870–1929,* however, one finds an excellent and informative, though brief, section on the substance of Juglar's contribution. The "great pioneer of the statistical and historical analysis of the trade cycle" (Hutchison 1953, 198) is called "more deserving than any other, of the title 'Discoverer of the Trade Cycle' " (370).

Nobody has done more than Joseph Schumpeter to provide Juglar with a lasting memorial in the pantheon of economics. He did it in steps. In the *Theory of Economic Development* of 1912, although it included a large chapter on crises, Juglar was not mentioned at all.[9] In his early survey of the history of economics, Schumpeter credited Juglar with having identified the oscillations in economic life as the essential phenomenon and having discovered that the immediate cause of crises is prosperity, thereby giving business cycle research its proper objective (Schumpeter 1914, 124). In *Business Cycles,* Schumpeter

9. A brief reference to Juglar's decisive contribution was added in the second edition (Schumpeter 1926, 334).

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added that Juglar was the first to have a clear perception of how theory, statistics, and history ought to cooperate in this field (1939, 162–63). More importantly, the cycles of six to eleven years' duration were now christened the "Juglars" (169). In the *History of Economic Analysis*, finally, Schumpeter ranked Juglar "as to talent and command of scientific method, among the greatest economists of all times" (1954, 1123). This was somewhat hyperbolic, to be sure; Juglar's method was lacking in theoretical analysis, and scores of economists before 1950 cannot have been inferior to him in talent. The main thing is that Juglar was now duly recognized as one of the important economists of the nineteenth century.

Even Schumpeter, however, failed to provide an adequate summary of Juglar's substantive findings, no doubt because Juglar was such an ineffective expositor. In conclusion, these findings may be listed as follows. Prosperity, crisis, and depression are phases of an endogenous dynamic mechanism. This cyclical mechanism is a concomitant of economic growth. It originates in the credit system, and its core components are the interactions between credit, interest, and prices. These interactions produce asymmetric relaxation oscillations of variable duration. Bank discounts and metallic reserves are reliable barometers of these oscillations and can even be used for prediction. The business cycle cannot be abolished, but a reduction in forecasting errors would mitigate it.

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