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## **ECONOMICS 303Y1**

### **The Economic History of Modern Europe to 1914**

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#### **Lecture Topic No. 11:**

#### **III. GREAT BRITAIN AS THE UNCHALLENGED INDUSTRIAL POWER, 1815 - 1873**

##### **A. Trends and Price Movements, 1815-1873**

[note: this lecture, not given orally in class, has not been revised, except for the two Canadian monetary tables, which have been updated to include the most recent data, for 2008.]

## V. GREAT BRITAIN AS THE UNCHALLENGED INDUSTRIAL POWER, 1815-1873

### A. Trends and Price Movements, 1815-1873

#### 1. The Era of British Economic Hegemony, 1815 - 1873:

These years from the end of the Napoleonic Wars in 1815 to the financial crisis of 1873, which ushered in the so-called 'Great Depression of 1873-1896 — these six decades from 1815 to 1873 -- mark both the completion of the British Industrial Revolution and Britain's decisive economic hegemony in the world: in industry, shipping, trade, and banking.

#### 2. We stop at 1873 for this section, not just because of the so-called 'Great Depression,' but:

a) **because the 1870s marks the end of British industrial hegemony**, as both Germany and U.S. provide strong challenges and then overtake Britain in certain crucial industrial fields before World War.

b) **So after this section we must next go to the continent:** to examine industrialization of France, Germany, and Russia: and then return, for the final section, to Great Britain, 1873-1914.

#### 3. An Examination of the major trends, cycles, and price movements from 1815-1873.

a) **This will help provide an overview of the major structural changes:** those that occurred in the British and European economies in this era; and will help demonstrate the intrinsic instability of the industrializing British economy, especially as it became more dependent on international trade.

b) Monetary and price aspects of this will also set next topic of banking in better perspective.

#### 4. Main Cycles: 1815-1873, with two major trend periods

a) **1815-1842:** Completion of the Industrial Revolution, with very uneven growth in form of two depressions and two booms. Deflationary.

i) **1815-1821:** Post Napoleonic War depression, with very painful reconversion to a peace-time economy; very painful for agriculture.

ii) **1821-25:** post-war recovery and boom, especially based on Latin American trade and investments, with speculative boom.

iii) **1825-6:** financial panic, credit collapse, sharp recession

iv) **1826-1836:** recovery and then rapid boom, based especially on heavy railroad investments, but also cotton & iron; American investments

v) **1836-1842:** Financial crisis, which began in the U.S.; and American credit collapse 1836-9 produced

severe depression in Britain, and unemployment, with the nadir in 1841-2. (Also British internal causes)

- b) **1842-1873:** Secular Upswing, Expansion, & Boom: ‘Growth by Leaps and Bounds’. In general, an inflationary period. Marked the greatest expansion of the British economy and its decisive hegemony.
- i) **1842-45:** recovery and renewed investment boom, domestic and foreign 2<sup>nd</sup> major railway boom.
  - ii) **1845-47:** financial crisis, disastrous harvests, bank failures.
  - iii) **1847-57:** recovery, strong expansion and boom: ‘Golden Age’ especially aided by California and Australian gold-mining booms and rapid expansion in both foreign trade and foreign investments.
  - iv) **1857-58:** financial crisis, briefly interrupting the boom, again resulting from an American financial crisis; but no real recession.
  - v) **1859-1866:** renewal of boom, and continued upswing, marking start of

## 5. Significance of Price Movements

a) **Marc Bloch:** ‘Monetary phenomena are like a seismograph that not only registers earth tremors, but sometimes brings them about.’

i) **That means that price trends,** while reflecting changes in economic activities, may certainly also influence the course of economic activities:

(1) higher prices, if they raise profits, may encourage more investment and business expansion;

(2) falling prices may conversely so constrict profits and interest as to discourage investment and production (i.e. if costs don’t fall with wholesale prices).

ii) **If you are familiar with the debate on the 16<sup>th</sup>-century Price Revolution (which I did mention much earlier in this course),** you may have seen that the major forces influencing or governing price movements may be classed under two headings: monetary, and real.

(1) Just as in the 16th Century Price Revolution, so in many subsequent periods, including the 19<sup>th</sup> and 20<sup>th</sup> centuries, debate continues to rage as to which was or is the more important.

(2) Today those who favour the so-called ‘real’ approach are generally followers of Keynes and the Keynesian school; those who favour the ‘monetary’ approach, or Nobel-prize winner Friedman.

b) **The Monetary Approach:**

i)  $M.V = P.T$  or better:  $M.V = P.y$ , in which *y* stands for *real* net national income; and thus *P.y* is equivalent to NNP or NNI at current prices. [But most data are in terms of GNP, unfortunately]

ii) **Quantity Theory School:** maintains that Velocity and T are to be considered constant, or mutually balancing (as V moves up, so does y or T), so that essentially changes in the quantity of money determine prices.

iii) Money: consists of coins, banknotes, chequing deposit accounts in the bank, short-term credit instruments, like bill-of-exchange, etc.

iv) Bank-notes or paper money: note that, with the exception of the Napoleonic War period, from 1797-1815, the supply of printed banknotes was a function of the gold supply, until World War I.

(1) That is, all banknotes were cashable on demand for gold coins, or gold coins were exchangeable into notes on demand; thus banks issuing notes had to be sure of enough gold on deposit to redeem or exchange those notes; and hence it was dangerous to issue banknotes above gold reserves; and when gold reserves fell, note issue contracted; when they rose, it expanded.

(2) Chequing account-deposits, however, show no such fixed relationship to gold supplies; so that gold only partially determined money supply.

v) **Effect of increased gold supplies: banks receiving the gold will issue notes in exchange**, thus expanding the note issue; expanded note issues will permit commercial banks to expand loans, at lower interest r. Increased loans and investments stimulate econ. activity, employment.

vi) **Decreased gold supplies:** if many merchants and businessmen have to pay for more foreign goods in gold, will have to buy gold with banknotes the money supply will contract; with reduced money supply, banks will be able to permit fewer or smaller loans, and at higher interest rates; smaller volume of loans, reduced investment, curtailed production, possibly leading to unemployment and depression, and more deflation.

b) **The Real Factors:** may be summed up by technology and investment

i) **technological innovation can obviously bring about a fall in prices by the significant cost reductions that result:** i.e. revolution in cotton industry cut cost of such textiles by 90%; revolution in iron making cut prices by about two-thirds; canals cut transport costs by about one-third to one-half; and railroads even more after 1830.

ii) **Reorganization of factors of production may also be cost-cutting as well as applications of inventions**, especially if such reorganization not only makes more efficient initial use of resources but increases scale of production to achieve those increasing returns to scale or economies of large scale, with falling marginal costs, that you learn in ECO 100Y, and 200Y, etc.

iii) The so-called agricultural revolution, with enclosure, of the 18<sup>th</sup> century; the factory system of

production; again the canals.

iv) **Hence the significance of investment as a ‘real force’ in price changes; but investment may have different effects on prices:**

(1) cost-cutting and price reducing effects: to summarize what have been said: the ‘real’ factor of investment may lead to falling prices if that investment involves cost-cutting technology, more efficient use of factors of production, and increasing returns to scale. But above all investment, to be price-reducing, must produce quick returns, in the form of consumer goods and services. Why? Because investment involves the creation of new incomes, and must be goods to match incomes.

(2) thus, inflationary impact of investment: arises when the investment projects take a long-time to complete and even longer to produce their fruits in the form of added consumer goods and services. For example, transcontinental railroads; but also large steel mills, electrical power stations. Larger the scale, longer the term of investment.

v) **Why inflation?** To repeat the fact that such investments create immediately new incomes with no extra consumer goods to match it. Hence demand, in form of money incomes, rises faster than supply.

vi) **Warfare:** obviously particularly inflationary form of such investment. Large expenditures and income with no goods created.

vii) **Long-term view of investment:** as technological & entrepreneurial changes dictated larger forms of industrial enterprise with heavier capital investments, such investments if occurring together in economy, could be inflationary in the short run, but deflationary in long run.

viii) **Note also that investment contractions can lead to depressions and unemployment, which in turn will be deflationary.**

(1) That is, prices will fall because current supplies of goods exceed demand - i.e. demand falls with both contraction of investment spending & unemployment so that producers have to cut prices to move their goods.

(2) A downward spiral of prices can result, as less efficient producers are forced out of business by losses, and as people reduce spending in anticipation of further price falls. (Self-justifying price-decrease).

ix) **Other Real Factors:** in particular demographic forces, of the effect of, say, a growth of population and thus a growth in the number of people demanding goods and services. That can obviously lead to a price-rise, if production and supplies do not also increase; and especially if there are relatively fixed natural resources and land to meet that growth in numbers. (As in 16<sup>th</sup>-century Price Revolution). Hence, with

population growth & no technological change, see prices of foodstuffs, fuels, basic raw materials rise (but other prices not so).

## 6. Business Cycles and Economic Trends: Simiand's A and B Phases

- a) **the A Phase:** generally inflationary, marked by increased investments and economic activity, new settlements; rising population, etc.
- b) **the B Phase:** generally deflationary, marked by reduced investments and contracted volume of business activity, often as depressions; sometimes also by falling population, and contraction of settlement.

## 7. Specific Explanations of Price Movements: from 1815 to 1873

- a) **From 1815 to early 1840s:** a mixed and mild B Phase, with generally a downward swing in prices, and interest rates.

### i) **The Monetary Factors: twofold**

(1) first has to be seen in perspective of preceding period of rampant inflation during war-years of 1790s to 1815: war itself was highly inflationary, but a very serious monetary factor was the so-called Paper Pound of 1797-1815. With threat of French invasion in 1797, Bank of England suspended gold payments, for their notes. Result was a horrendous issue of paper banknotes, unchecked by need to have gold reserves.

(2) Once Napoleonic wars were over, Bank of England restored a convertible gold currency, and forced private banks to do likewise. Hence a very significant contraction in the money supply resulted, to match gold supplies.

(3) also there had been no significant new mining of precious metals, since Mexican silver mining boom of mid-18th century; and Brazilian gold mines were evidently suffering from depletion. Thus stock of precious metals diminishing, or not expanding to meet needs of a greatly expanding European & especially British economy.

- ii) **Real side:** the character of investments. In this period, the great bulk of investment was in very productive enterprises, especially so since this period had no serious warfare to drain off capital. Most of enterprises were of short-run character, producing quick returns on investment — even the early railroads, which involved no great distances.

- iii) **technology perhaps the major reason:** for this was the period that the Industrial Revolution had its greatest impact in creating mass-production methods sharply reducing costs.

(1) Especially in cottons, with the power loom from the 1820s; the iron industry with Neilsen's

hot blast from 1829;

(2) mass application of steam engineering; and impact of railroad in sharply reducing transportation costs & thus production costs.

iv) **agriculture:** experienced very sharp falls in prices after 1815, as Enclosure and modern techniques finally brought forth their fruits of rising productivity; period in which output overtook population growth; but also unhindered food imports (except for the Corn Laws — later)

b) **Late 1840s-1873:** ‘Growth by Leaps and Bounds’: period of general inflation, rising interest rates and profits as well as prices.

i) **monetary factors:** in two respects

(1) Great gold mining booms of California and Australia: vastly increased the world’s gold supply; and gold had now displaced silver as the chief monetary metal and basis of credit.

(2) Expansion & improvement of banking facilities, not just in Britain but also continental Europe and America. As we shall note later, there was a considerable growth in cheque transactions and also of discount houses that supplemented banks in discounting all kinds of commercial paper.

ii) **real side:** the character of investments.

(1) Rostow argued that there was a shift of capital investment to less productive uses, especially in the form of significantly increased warfare (Europe, U.S., Asia) that had the effect of generating income without providing consumer goods to absorb that income.

(2) The same can be said of gold mining investments.

iii) **Equally important was shift in investment more and more to longer-term enterprises:** i.e. involving a much longer period before returns on the original investment were achieved, involving a much longer period before producing a lower cost structure.

- Also technology less dramatic in cost cutting, evidently. Major examples of such longer-term investments are the construction of vast and far-flung railway networks in Europe, the Americas and Asia (as compared to short lines in Britain).

- Also investment booms in steam and iron shipbuilding; construction of steel mills; in general, the building of the infrastructure necessary for European and American industrialization.

## 8. Changing Character of Business Cycles, 1815-1873

a) **Capital investment:**

i) **including both domestic and foreign or overseas investments**, may have played the predominant role in the economic swings — the booms and recessions — from 1815 to 1973. ii) **Certainly as the trend became accentuated from at least the 1840s to much larger scale forms of industry and enterprise**, involving much more complex technologies, the capital investment cycle became a predominant force in the secular trends as well as business cycles because of larger volume.

b) **Business crises and recessions were, by and large, started:**

i) by financial crises that came at the height of capital investment booms

ii) most of the crises resulted from an imbalance between too much fixed capital investment and thus too little in the way of working capital investments, and thus too little liquidity.

iii) High interest rates and profits evidently attracted too much capital into very long term capital investment ventures

iv) Thus, in relation to the greatly expanded production facilities made possible or created by this scale of capital investments, there was a relative shortage of working capital to meet the day to day needs of business operations, in terms of financing the wage bill, maintaining inventories, etc.

v) Thus a crucial lack of liquidity and lack of funds to permit businesses to maintain their daily operations when the trade cycle slackened or when credit became tighter -- a general lack of resilience in the economy.

c) **Other Factors in the Business Cycles:**

i) **Other Major Factors in the Business Cycles: capital investments were not the only factor in business cycles:** there were three others, very volatile factors, that explain more of short-term fluctuations: (1) inventory or trade cycles, (2) speculative fevers in securities, (3) the role of the harvest — high vs. low grain prices. These three all are more important in first phase B than in second phase A.

ii) **Up to the 1840s**, the dominant features seem to be inventory cycles, grain harvest fluctuations, and speculative fevers

iii) **From the 1840s to the 1870s:** investment cycles became more and more predominant, especially with the dual transportation revolutions and the spread of industrialization elsewhere in Europe, the Americas, and the rest of the World.

d) **The inventory or trade cycle, up to the 1840s: with speculation and impact of grain harvests:**

i) **trade inventories were stocks of goods that manufacturers & merchant maintained in anticipation of sales:** We begin by supposing that they are encouraged to build up their inventories in response to expanded overseas trade, higher prices, etc. & optimistic forecasts, thus encouraging the relevant industries to expand investment & production.

- ii) **The critical problem was one of overexpansion**, especially since most would be acting on the same types of information, often imperfect & certainly out of date, with slow transport & communications.
  - iii) **Thus with imperfect knowledge**, production might well expand beyond the capacity of domestic and foreign markets to absorb it all.
  - iv) **Speculation:** was especially the consequence of great imperfections in transportation and communications, ie. before railroads and the telegraph; and thus before changes in market conditions could be reported back to producers, a glut would result.
  - v) **Once overstocking and the glut became apparent**, often a panic reaction of suppliers to slash prices to reduce their inventories, and of course immediate cessation of orders to the basic producers.
  - vi) **That could, and certainly did in 1820s and 1830s, result in bankruptcies in chain reaction form**, credit contraction industrial collapse, widespread unemployment thus producing a general recession/depression.
- e) **Significance of Agriculture in Business Cycles:** to late 1840s.
- i) Until c. 1850, agriculture still remained a major sector of the economy, and British still produced bulk of own food supply.
  - ii) Thus, given inelastic demand for grains, a bad harvest could have serious, damaging effects on the economy: twofold effect of high price
    - (1) as higher percent of income spent on food, reduction in demand for domestic industrial goods and services; but worse: -
    - (2) an outflow of gold to pay for increased grain imports; and gold outflow would thus reduce bank reserves, and consequently contract the paper money supply and credit, raise interest rates, have deflationary impact on the economy, on occasion seriously disruptive as in 1840s.
    - (3) Effect of good harvest and low grain harvests: was converse — to increase real incomes (though some reduction in agri. sector) and expand domestic consumer demand; reduce food imports, permit expansion.
    - 4) **Harvests: there is in fact a fairly strong correlation between bad harvests and economic crisis up to the 1840s**, on the one hand; and between good harvests and upswings in the economy. Harvest hardly the only or even major reasons in either case, but was clearly important factor.
  - iii) **from 1850s effect of the harvest diminished considerably**, to become quite unimportant by the very late 19<sup>th</sup> century: Reasons:

(1) that the agricultural sector diminished to a very small proportion of the British economy by 1900 - perhaps 8%;

(2) especially as the transportation revolution permitted opening up of vast new areas of grain cultivation in Eastern Europe, the Americas, Australia, permitted cheap imports, and as industrialization provided exports to pay for food imports.

f) **In sum:** wide and sometimes wild swings in production and inventories resulted from essentially imperfect knowledge about the market and hence unsound bases for business predictions.

- These problems diminished considerably after 1840s with the great transportation revolutions in railroads and steam shipping,
- especially with such improvements in communications as the electromagnetic telegraph in 1838; but also resulted from great expansion & solidification in foreign trade with continental and American progress towards industrialization.

## 9. Financial Character of Business Crises, from 1842 to 1873

a) **Business crises and recessions:** by and large, were started by financial crises that came at the height of capital investment booms.

b) **Most of the crises resulted from imbalance between too much fixed capital investment with too little working capital and liquidity:**

i) that is to say, high interest rates and profits had attracted too much capital into very long term investment projects;

ii) and especially in relation to expanded production facilities from this investment, the economy had left in it too little working capital, too little liquidity to permit business firms to sustain themselves when the market became bad, and when credit became tighter, more contracted; i.e. there was not enough working capital to give the economy proper resilience.

c) **Financial Speculation:**

i) **Continued to be also major factor in crises, in both stock and commodity markets.**

(1) Speculative fevers as before fed investment booms to excessively inflated degrees, reaching point where both consumer demand for the products of investments and market skepticism about future of the boom would halt rise in security prices.

(2) Then, as before, the bubble would burst and a panic wave of selling would ensue, producing a general contraction of credit:

ii) **stocks and other such securities were often the collateral for loans, bank credits:** when value of

collateral fell, loans be recalled.

iii) **fall in stock markets seriously affect confidence in general**, and willingness to invest, to extend credit

iv) **increase in liquidity preference**: fear of falling values and fear that cash be needed cause people to convert assets to cash, to liquidate investments.

v) **Results**: Funds for both working capital and fixed capital, but in short run, especially for working capital, dry up; contraction and recession — especially in the form of business collapses, bankruptcies.

vi) **These in turn produce a panic and general credit contraction & recession.**

vii) **In sum:**

(1) wide and often wild inventory and production swings resulted from such market imperfections,

(2) and these diminished considerably with the transportation revolutions in the railroad and steam shipping, but especially with the invention of the electromagnetic telegraph in 1837/8.

d) **Fixed Capital Investments**: this aspect should not require any elaboration.

i) **You should know from Keynesian macro-economics how and why large fixed capital investments in**, say, railroads, steam shipping, munitions, steel mills, etc. could have a strongly inflationary multiplier and accelerator effect; and how sudden cessations of such investments would have a decelerator, deflationary effect on the economy.

ii) I have already commented why, especially with spread of Industrial Revolution abroad, this became a much stronger force from the 1860s.

e) **Financial Speculation, Financial Crises**:

These were nothing new, as we have seen in particular with the 1720 South Sea Bubble; but they became more important after 1805, especially as Great Britain began investing more and more heavily in North and South American trade, and in N & S American government bonds (national and state). Problems:

i) **great imperfections in the investment institutions & machinery**: the absence of joint-stock company structure for most commercial enterprises the primitive stock exchange facilities, restrictions on banking organization until 1830s.

ii) **the inability or failure of the Bank of England to act as a proper central bank**, its refusal to give up role as competitive private bank until 1870s, a major problem explaining financial volatility.

iii) **grossly inadequate knowledge of foreign conditions**, combined with very heavy investments in foreign government bonds: in not only North and South America, but also much of Europe — resulting from Britain's role as the banker and financier of Europe during Napoleonic wars. iv) **Evidently there was an almost naive faith in ability and willingness of foreign governments to honour their loans.** American state

gov'ts some of worst offenders.

f) **Significance of the United States:**

- i) already seen that as result especially of trade patterns built up during Navigation Laws, Old Colonial System, and of other historic ties, all of which handily survived the American Revolution, the United States became Britain's single most important market overseas (33% in 1800) by the early 19<sup>th</sup> century;
- ii) and until U.S. became Protectionist after the Civil War of 1860s, U.S. was easiest most promising area for Britain to expand its exports, especially as settlement and population expanded.
- iii) Cotton especially was the dominant import from U.S. in return for
- iv) For all these reasons U.S. became major recipient of British overseas investment, indeed financing much Anglo-American trade: British investments, mainly in form of bonds, in American canals, then railways and mines, and especially in American state bonds.
- v) Hence any American financial or economic crisis was quickly spread to Britain, especially in the form of repudiation or collapse of British credits & loans.

### BRITISH BUSINESS CYCLES AND PRICE TRENDS, 1815 - 1914

1. **Secular Trend of 1815-1842:** Completion of the Industrial Revolution. A mild and mixed Phase B, with two depressions and two booms. *Deflationary.*
  - a) **1815 - 1821:** Post-Napoleonic War depression, with very painful reconversion to a peace-time economy and sudden monetary contraction.
  - b) **1821 - 1825:** Recovery and powerful boom, based especially on Latin American trade and investments; a speculative boom period
  - c) **1825 - 1826:** commercial crisis, financial panic, sharp recession
  - d) **1826 - 1836:** recovery and then very rapid boom, based especially on large railway investments, but also in cotton and iron & the U.S.
  - e) **1836 - 1842:** Financial crisis generated in the U.S., with a credit collapse that spread to Britain and produced severest depression of the 19<sup>th</sup> century. Also internal causes; especially in the metallurgical and railroad engineering industries. Nadir in 1841-42.
  
2. **Secular Trend of 1843 - 1873:** A very strong Phase A. A Secular upswing expansion, and boom known as ‘Growth by Leaps and Bounds.’ Marked the period of greatest expansion for the British economy in the 19<sup>th</sup> century and decisive hegemony of the British economy. *Inflationary.*
  - a) **1842 - 1845:** Recovery and renewed investment boom, especially in railways (Second Railway Boom); but also in foreign trade and loans.
  - b) **1845 - 1847:** financial crises & disastrous harvests. Bank failures.
  - c) **1847 - 1857:** recovery, strong industrial expansion and investment boom. The so-called ‘Golden Age’ of Britain. Especially marked by the Californian and Australian gold-mining booms; and very rapid growth of British foreign trade and foreign investments and British railway building at home and abroad. Beginnings of steam-shipping.
  - d) **1857 - 1858:** financial panic, briefly interrupting the boom, again originating in the United States; but only a mild depression.
  - e) **1859 - 1866:** renewal of the boom, and continuation of the upswing, marking the start of the ‘steel revolution:’ and also: the fourth and major railway construction boom; shipbuilding boom; export boom.
  - f) **1866 - 1868:** domestic banking and financial crisis; stock market crash. Produced severe contraction and unemployment, but only briefly.
  - g) **1869 - 1873:** sharp recovery and major boom, especially in shipbuilding.

- h) **1873**: Financial panic in Vienna, spreading to Germany, France, U.S. and Britain. Though less severe in London, did mark the end of the great secular upswing, and beginning of a 23-year secular downswing.
  
- 8. **1873 - 1896**: The 'Great Depression.' **Phase B**: very deflationary.
  
- 9. **1896 - 1914**: Pre-War Boom and Secular Upswing. Generally, **Phase A**.

## ECONOMICS 201Y and 303Y

### MODERN QUANTITY THEORIES OF MONEY: FROM FISHER TO FRIEDMAN

Most economic historians who give some weight to monetary forces in European economic history usually employ some variant of the so-called **Quantity Theory of Money**. Even in the current economic history literature, the version most commonly used is the Fisher Identity, devised by the Yale economist Irving Fisher (1867-1947) in his book *The Purchasing Power of Money* (revised edn. 1911). For that reason we cannot avoid it, even though most economists today are reluctant to use it without significant modification.

1. **The Fisher Identity, or The Equation of Exchange:  $M.V \equiv P.T$**

**M** = stock of money in coin, notes, bank deposits ('high-powered')

**V** = the velocity of circulation; the rate at which a unit of money circulates in effecting transactions in course of one year; the average number of times it 'turns over'

**P** = some measure of the price level; e.g. Consumer Price Index

**T** = the total volume of monetary transactions that take place in the economy during the course of that same year.

a) **This is more of an identity ( $\equiv$ ) or tautology than it is a causal equation:** it simply states that total spending, in terms of the money stock multiplied by the rate of its turnover or circulation, necessarily equals total spending in terms of the total volume of monetary transactions multiplied by the current price index. The two values on each side of the  $\equiv$  sign are necessarily identical.

b) **Problems with the Fisher Identity:**

i) **M** and **P**, it has been argued, are extremely difficult to estimate or calculate. For the medieval, early modern, modern, and present day eras this is a form of nitpicking that in no way invalidates the model. Good proxies can be provided for most of these eras, certainly good enough to indicate general movements of both prices and monetary stocks. The other two objections are far more important.

ii) **T** really is quite impossible to calculate for any period or even to comprehend. That is, even if we could attach a numerical value to T, it would be rather meaningless: T = the total volume of all transactions in the economy, both intermediate and final, from raw materials to fully manufactured products along with all services. How can we resolve the problem of multiple counting? How can we add up all the transactions involving so many different commodities and services: with what common denominator? Adding together apples and oranges (as pieces of fruit) is a very simple task by comparison.

iii) **V**, as a measure of the velocity of circulation or turnover of money, is not in fact an independent variable, but rather a residual one, which has to be calculated algebraically by first knowing the other three. Thus we can calculate V only by this formula:  $V = (P.T)/M$

2. **The Cambridge Cash Balances Equation:  $M = k.P.T$**

This is a lesser-known rival to the Fisher Identity that emerged during the 1920s at Cambridge, with a formula that resolved at least the problems concerning Velocity:

a) **Its originators at Cambridge (especially A.C. Pigou) asked two principal questions:**

- (1) how much 'high-powered' money (usually called M1), do people currently wish to hold in the form of cash balances (money held in coin, notes, bank deposits), rather than being spent or invested?
- (2) What, therefore, is the ratio of those cash balances to the total money value of all transactions in the economy?

b) That ratio is indicated by the letter **k**; and this form of the Quantity equation now becomes:  **$M = k(P.T)$** .

- i) The letter **k** thus indicates the proportion of the total value of all monetary transactions that the public chooses to hold in cash balances; and thus it tells us the necessary amount of **M** that is required for that level of **P.T** (total spending).
- ii) Note that **P times T again equals the total monetary value** of all transactions; and thus suffers from the same problems of estimating the value of T, as indicated above for the Fisher Identity.

c) **Liquidity Preference:** a concept further developed by Keynes, who asked a fundamental question. Why do people wish to hold cash balances, instead of immediately spending or investing that money? He suggested three motivations.

- (1) **transactions motive:** people hold a stock of ready cash in order to meet their day to day needs in buying goods and paying for services, etc. This is deemed to be the major need for holding ready cash.
- (2) **precautionary motive:** to have ready cash on hand in order to meet some unforeseen emergency, as a contingency fund for future needs.
- (3) **speculative motive:** to have ready cash to take immediate advantage of some special investment opportunity -- a cash fund to speculate with.

d) **Cash Balances and Opportunity Cost:**

What is the cost of holding these cash balances?

- i) The true cost is the **opportunity cost:** i.e. the interest or other investment income *foregone* by not investing those balances. Consequently, we should find that cash balances are to some extent interest-sensitive, and vary with interest rates.

- ii) That is, the proportion of national income held in cash balances (**k**) should fall as real interest rates rise, because rising interest rates will increase the opportunity cost of holding those balances;
  - iii) and conversely that proportion **k** held in cash balances should rise with falling real interest rates.
- e) **Note that mathematically, the Fisher and Cambridge Cash Balances equations are related:** **k** is the reciprocal of **V**; **V** is the reciprocal of **k**

f) **What is the difference between **k** and **V**?**

Why is **k** a more useful variable than **V**?

- i) Because **k** is much more ‘predictable;’ and conceptually **k** is an ‘active’ variable -- i.e. we should be able to predict roughly what proportion of total national expenditures people wish to hold in cash balances.
  - ii) But **V**, on the contrary, is a passive (i.e. resulting from) or ‘residual’ variable, calculated as noted only by first knowing **M**, **P**, and **T**.
  - iii) Thus one might say that **k** (cash balances) is a **predictive** measure of velocity, while **V** measures only resulting velocity.
3. **The Basic Suppositions Concerning the Older Quantity Theories of Money**
- a) **The Demand for Money is chiefly a TRANSACTIONS DEMAND:**
  - b) **The Transactions Demand for Money will be proportional to the aggregate value of transactions (i.e. **k** as proportion of **P.T**); and this proportion will not vary in the short run;**
  - c) **The Supply of money is exogenously determined**, determined independently of the economy (by some external authority or events).
  - d) **Full Employment prevails:** so that any increase in aggregate demand will not increase the volume of output or transactions (**T**);
  - e) **Those with excess money will spend it on goods and services;** those with insufficient supply of money will cut their expenditures on goods and services.
  - f) **The Transactions Velocity of Money is, at least in the short run, very stable.**

4. **The Modern Form of the Quantity Theory: Friedman's Income Version**

- a) **While the Cambridge cash balances approach apparently resolved the problem of **V****, it did not resolve the quite intractable problem of **T**. Modern economists, however, have more or less resolved that

problem by ignoring the total volume of transactions, and by looking instead at the Net National Income or the aggregate of net national expenditures.

b) **To understand this, we can begin with the Gross National Product or its equivalent**, the Gross National Income: as the total current money value of all final goods and services produced in the economy in a given year.

- i) From that dollar amount we deduct a sum for ‘depreciation’ (for depreciation of worn out, wasted capital stock) in order to arrive at Net National Product. Thus, just as Gross National Product (GNP) = Gross National Income (GNI), so Net National Product (NNP) = Net National Income (NNI), which is represented here by the capital letter Y. That letter Y will be familiar to anyone who has studied at least the rudiments of Keynesian economics:

$$Y = C + I + G + (X - M).$$

- ii) That is, Net National Income (Y) equals the sum of total national Consumption (C) plus total Investment (I) plus Government Expenditures (G) plus the net difference between total Export incomes (X) and total expenditures on Imports (M).

c) Since this value **Y** is usually expressed in terms of current dollars, we must now express that net national income in dollars of unchanging values, i.e. in what are called ‘constant dollars’ that reflect a constant or stable purchasing power, which has been adjusted for inflation (thus the term: ‘deflated net national income’).

- i) That value of a deflated NNI, or ‘real NNI,’ or ‘net national income in constant dollars,’ is expressed by lower-case **y**.
- ii) Upper-case **Y** of course measures NNI in current dollars, which currently has meant a declining purchasing power, because of inflation.

d) This new value **y** or real **NNI** is obviously much more measurable than **T**. To calculate **y**: divide **Y** by **P**. That is, calculate the NNI by deducting depreciation from the GNP; and then divide that result (NNI) by some agreed upon price index (e.g. consumer price index):  $y = Y/P$ .

- i) For example: the value of the Gross Domestic Product in 1995 was \$776.30 billion. Divide that amount by the GDP Price Index (whose base is 1986 = 100), which is 134.0 -- i.e. meaning that this price index is 34.0% higher than the weighted average of prices for all items in the price basket for 1986. The result (divided by 1.34) is \$579.33 billion, which is the ‘real’ GDP for 1995 in constant 1986 dollars.
- ii) Unfortunately the data currently available are for GDP only, not for NNP; and these GDP data will have to serve as proxies for Y and y.

e) So, by using that ‘**y**’ value to express constant or deflated net national income (NNI), in place of unmeasurable T, in the two quantity theory equations, those Fisher and Cambridge equations now become:

- i) Fisher:  $M.V = P.y$

Thus  $V$  measures the income velocity of money: the rate at which a unit of money circulates in producing total net national income (or net national expenditures or net national product).

ii) Cambridge Cash Balances:  $M = k \cdot P \cdot y$  or,  $M = kPy$

Thus  $k$  measures the proportion of aggregate national income that the population collectively holds in cash balances.

iii) While the Cambridge version is conceptually preferable, it is mathematically related to the much more widely used Fisher equation, or better the modern income version of that equation ( $k = 1/V$ ). So you will presumably also prefer to use it: but at least please use it in this modernized form:  $M \cdot V = P \cdot y$  [ $MV = Py$ ]

iv) **Examples for 1995**

(1)  $M = k \cdot P \cdot y$                        $k = M/(P \cdot y)$

$$M_1 = \$57.14 \text{ billion}$$

$$P = 134.00$$

$$y = \$579.33 \text{ billion}$$

$$\text{GDP} = P \cdot y = 1.34 \times \$579.33 \text{ billion} = \$776.30 \text{ billion}$$

$$k = 57.14 / (1.34 \times 579.33) = 57.14 / 776.30 = 0.07360556$$

[Thus cash balances in high-powered money  $M_1 = 7.04\%$  of the total GDP (in current prices)]

(2)  $M \cdot V = P \cdot y$                        $V = (P \cdot y)/M$

$$M_1 = \$57.14 \text{ billion}$$

$$P = 134.00$$

$$y = \$579.33 \text{ billion}$$

$$V = (1.34 \times 579.33) / 57.14 = 776.30 / 57.14 = 13.586$$

$$k = 1/V \quad k = 0.07360556; 1/0.074 = 13.586$$

f) **What factors affect  $V$  and  $k$ ?**

i) **Any changes affecting those three elements of liquidity preference:** for the transactions, precautionary, and speculative demands for money.

ii) **Changes in population:** population structures, market structures, transaction costs, etc. requiring that a greater or smaller proportion of national income be held in cash balances.

- iii) **Changes in financial instruments:** many of which economize on the use of money, coined money, and so speed up the effective velocity of coinage
- iv) **Supply shocks:** effects of famine, war, war financing, etc; sudden increases in the supply of food, fuel, etc.
- v) **Predictions about the future value of money:** i.e. a form of ‘rational expectations:’ if you believe that in the future money will lose its purchasing power, you will get rid of it, i.e. exchange it for assets of more stable value: and thus reduce cash balances and increase money velocity.
- vi) **Interest rates and levels of national income:**

g) **Keynesian Criticisms of the Quantity Theories of Money:**

- i) **While quantity theorists believe that  $k$  or  $V$  are stable**, at least in the short run, Keynes and his followers believe(d) that these variables are highly unstable and volatile.
  - (1) in particular, they argue that  $k$  and  $V$  are highly sensitive to interest rates in the short run, which in turn are functionally related to changes in the money supply. In short, Velocity varies inversely with the money supply and directly with interest rates; alternatively, that  $k$  varies directly with the money supply and inversely with interest rates. Remember that the interest rate represents the opportunity cost of holding cash balances.<sup>1</sup>
  - (2) Thus, in the short run at least, an increase in the money supply  $M$  should lower interest rates, which in turn should reduce Velocity (or permit a rise in  $k$ ). Furthermore, a more plentiful money supply reduces the need to **economize** on the use of money, thus also reducing Velocity (or encouraging larger cash balances).
- ii) **While quantity theorists have looked upon the aggregate money supply (continental or world -- depending on the era) as largely *exogenous***, Keynesians have considered it to be largely **endogenous**, and a function of the real factors determining production and trade.
- iii) **The classic Quantity Theory of Money, as noted earlier, assumed a normal or equilibrium state of Full Employment**, meaning that all resources would be fully employed, so that any increase in monetized spending would have to drive up prices proportionally, since any further increase in production and trade was impossible (in the short run).
- iv) **Keynes, writing during the Great Depression years, argued that underemployment of**

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<sup>1</sup> See J. M. Keynes, *General Theory of Employment, Interest, and Money* (1936), p. 298: ‘The primary effect of a change in the quantity of money on the quantity of effective demand is through its influence on the rate of interest.’ And further, on p. 336: ‘Now, if the wage-unit is somewhat stable..., if the state of liquidity-preference is somewhat stable..., and if banking conventions are also stable, the rate of interest will tend to be governed by the quantity of the precious metals, measured in terms of the wage-unit, available to satisfy the community's desire for liquidity.’

**resources was more often the normal state;** and that an increase in monetized spending would induce the productive employment of further resources, resulting in an increased output and trade that would counteract any potential inflation from that increased spending.

iv) **Keynes on longer-term inflation:**

In criticizing the classical Quantity Theory of Money, he stated: ‘So far, we have been primarily concerned with the way in which changes in the quantity of money affect prices in the short period. But in the long run is there not some simpler relationship? This is a question for historical generalisation rather than for pure theory...’ [*The General Theory of Employment, Interest, and Money* (1936), p. 306.]

v) **Observations:**

- (1) Can we assume such perfect elasticity of response of  $V$  or  $k$  to changes in  $M$  and to changes in interest rates: Would an historian, usually studying somewhat ‘longer runs’ than those assumed by economists, believe that  $V$  or  $k$  would always change in exact proportion to changes in  $M$ , over long periods of time?
- (2) We may deal with that question by assuming that, to the extent that changes in  $V$  or  $k$  are not exactly proportional to the changes in  $M$ , the difference is taken care of by increases in production and trade, i.e. by the changes in  $y$ . But again the historian may doubt that all the changes -- in  $M$ ,  $V$  or  $k$ , and  $y$  -- are always so neatly counterbalancing, so that  $P$  (the price level) remains stable.
- (3) We may agree that the money supply, especially for any given region or country, is far more endogenous than was assumed by the classical Quantity Theory; and that changes in real factors, changes in investment, production, and trade, may well induce necessary changes in the money supply, especially if the money supply is heavily based on credit instruments. But what about a pre-modern money supply that is far more based on precious metals? Are changes in the supply of precious metals and in mint outputs so fully endogenous in the Keynesian sense? Furthermore, what about coinage debasements: what determines them?
- (4) In summary, supposing that the money supply was essentially endogenous, one may argue that the various economic processes increasing  $y$  (NNI) -- e.g. population growth, technological changes, investment, changing foreign trade patterns -- induced the requisite monetary expansion: in  $M$ , or in  $V$ , or in both together. If, however, inflation also occurred (a rise in  $P$ ), historians must then explain why the evident monetary expansion was greater than the rise in real output and real incomes: why, with  $\Delta P, \Delta(M.V) \gg \Delta y$ .
- (5) The following section develops this theme; but to make the argument perfectly clear and to ensure a logical flow, many of the points made in this series of observations are necessarily repeated.

## 5. Monetary and Real Factors in the Quantity Equations

a) **If you look carefully at these equations**, you will see that they are not in fact purely monetary, but contain a *real* element, which is much more clearly seen in the modern versions: i.e.  $y$  for *real* NNI or NNP.

b) **Thus, in terms of  $M.V = P.y$** , what will happen when you increase the stock of  $M$ , increase the Money Supply? Some combination of any or all of the three following might well happen:

i) Some increase in  $y$ : an increased quantity of  $M$  in circulation stimulates the economy and promotes increased production and trade, thus increasing incomes: thus producing a rise in NNP and NNI.

ii) Some reduction in  $V$ : since money is more plentiful, there is less need to economize on its use; its rate of circulation slows down; or some fraction of that increased  $M$  goes into hoards or larger cash balances. Furthermore, if an increased  $M$  results in lower interest rates,  $V$  should also fall for that reason (i.e.  $k$  would rise).

iii) Some increase in the Price Level  $P$ . But note carefully: to the extent that  $y$  rises, and to the extent that  $V$  falls, then the rise in the price level ( $P$ ), the degree of inflation, will be proportionally much less than the increase in  $M$ .

- Conceivably, an increase in  $M$  could be totally offset by both a fall in  $V$  and an increase in  $y$  -- so that no inflation would result. Thus inflation is far from being an automatic result of increasing the money supply -- it is from being predictable; and thus price changes depend upon purely real as well as monetary factors.

- But we have reason historically to doubt that all these factors will so automatically and neatly counterbalance each other.

b) **Consider the older views on these issues of inflation:**

i) **Old-fashioned quantity theorists of 19th century**, and even Fisher, were looking essentially only at short term changes, and they assumed that any economy in 'equilibrium' must be operating at full employment, with no capacity for increased output, and with a constant money velocity.

- Thus, in their view, a 10% increase in  $M$  must produce a proportionate or 10% increase in  $P$ , the price level. Historically, however, that proves to be quite false: there is almost never any linear relationship between changes in money supplies and prices.

ii) **Keynes**: formulating his *General Theory of Employment* during the grim depression years of the 1930s, with mass unemployment.

- He assumed an economy with a large amount of unemployed resources, a highly elastic economy very responsive to changes in demand.

- He was also assuming that changes in  $M$  resulted endogenously from changes in investment

or government expenditure, increasing output, income, and aggregate demand.

- Such increases in an economy of unemployed resources would be reflected by a rise in real net national product and income (**Y**) without any inflation, at least until the point of Full Employment was reached.
- But, Keynes argued, once that point of full employment was reached, the traditional quantity theory would then finally apply: further increases in spending would be purely inflationary -- his concept of the 'inflationary gap'.

c) **The Phillips Curve:**

i) **Phillips:** a modern British economist (1958) who found a close correlation between changes in the price level and unemployment rates, from the 1860s to the 1950s:<sup>2</sup> the closer that an economy approached full employment, the higher or faster rose the price level; the higher the rate of unemployment, the more stable was the price level. This is not the either/or proposition of the traditional Keynesian backward L-shaped macro-diagram for  $Y = C + I + G + (X-M)$ , but a relationship plotted along a rising or falling curve, demonstrating a trade-off between unemployment and inflation: the less of the one, the more of the other.

ii) **An inverted form of the actual Phillips curve**, in the form of an upward sloping aggregate supply curve, can best demonstrate this in terms of what we are talking about.

- Here full employment means not just full employment of the labour force, but full employment of all resources in the economy. We thus begin, as did Keynes, with an economy with considerable underemployment of resources -- at much less than FULL EMPLOYMENT.
- Thus, as aggregate demand rises, and as supply increases to meet that demand, resources in some sectors become more or less fully employed, producing some price increases in those sectors.
- That is, diminishing returns set in and supply becomes less and less elastic, less capable of expanding except at very high cost, thus producing price increases.
- But in other sectors, supply remains more flexible, more elastic, so that production can expand there without rising prices. As aggregate demand further increases, however, more and more sectors encounter these rigidities with rising costs, and a rising price level becomes more and more general.<sup>3</sup>

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<sup>2</sup> A. W. Phillips, 'The Relation Between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1861 - 1957,' *Economica*, 25 (1958), 283 - 299.

<sup>3</sup> In fairness to Keynes, he virtually said as much in his *General Theory of Employment, Interest, and Money* (1936), p. 300: 'It is probable that the general level of prices will not rise very much as output increases, so long as there are available efficient unemployed resources of every type. But as soon as output has increased sufficiently to begin to reach the 'bottle necks', there is likely to be a sharp rise in the

- To repeat: the more fully employed resources become across all sectors and markets with rising aggregate demand, the greater proportionally will be the increase in the price level and the less proportionally will be the increase in real output. But it is difficult to envisage any economy, over time, which has no capacity for further output -- absolute full employment. There are always some technological and organizational changes possible to achieve some real gains.

iii) **To put this in terms of the modern quantity theory:**

- in so far as an increasing  $M$  or increasing  $V$ , or an increase in both variables, means an increased aggregate demand, we can expect to find some unpredictable combination of rising output and incomes on the one hand (i.e. increasing  $y$ );
- and then rising prices ( $P$ ) on the other: and the closer the economy approaches full employment, the more increased spending will be inflationary.
- Conversely with heavy unemployment, in an economy with much of its resources lying idle, unutilized, an increasing  $M$  and rising aggregate demand will produce increased real output and incomes (in  $y$ ), without any significant price increases.
- Thus the extent of inflation, or price increases, depends as much on these real factors as on the purely monetary factors.

- iv) **Friedman and other ‘monetarists’:** have criticized the economic logic involved in the Phillips curve (concerning expectations of real vs. nominal or money incomes, etc.); and have offered a radically revised version. But time and space, and our mutual energies, do not permit an extended discussion of that debate here.

d) **The effect of population growth may be twofold:**

- on the supply side:** for  $y$ : population growth can lead to fuller or full employment of resources, diminishing returns, rising marginal costs across most sectors of the economy, in the absence of further technological changes (including changes in markets, financial instruments).
- on the demand side:** for  $M$  and  $V$ : population growth will initially increase the demand for money (and will thus increase  $k$ ), and thus reduce any inflationary impact from any increase in  $M$ . But population growth may also or subsequently change the structure and distribution of that population; and increased urbanization, and consequent changes in markets and financial structures, may lead to a reduced  $k$  -- or, to say the same thing, an increased  $V$ , an increased velocity of money circulation.

**Money Supply, GDP, and Prices in Canada, 1955 - 2008: Annual Means of monthly data**

<b>Year</b>	<b>M: MB</b> = Y/M <b>Money:</b> <b>Monetary</b> <b>Base in</b> <b>billions</b>	<b>V</b> = Y/M <b>Income</b> <b>Velocity</b> <b>of M:</b> <b>Mon Base</b>	<b>k</b> <b>Cambridge</b> <b>cash</b> <b>balances</b> <b>k = 1/V</b>	<b>P</b> <b>CPI</b> <b>June 1992=</b> <b>100.00</b> <b>CANSIM</b>	<b>y</b> <b>Real GDP:</b> <b>in billions of</b> <b>1992 dollars</b> <b>CANSIM</b>	<b>GDP = Y</b> <b>Gross</b> <b>Domestic</b> <b>Product in</b> <b>billions</b> <b>current</b> <b>market</b> <b>prices</b> <b>CANSIM</b>	<b>Population</b> <b>Canadian</b> <b>population</b> <b>in millions</b>	<b>Inflation:</b> <b>Percent</b> <b>Change</b> <b>in CPI</b>	<b>Bank</b> <b>Rate</b> <b>in percent</b>	<b>Real GDP</b> <b>per</b> <b>capita</b> <b>in dollars</b>
<b>1955</b>	2.2588			16.83			15,681,250		1.896	
<b>1956</b>	2.3793			17.07			16,070,250	1.39%	3.153	
<b>1957</b>	2.4378			17.60			16,579,500	3.12%	4.023	
<b>1958</b>	2.5973			18.04			17,062,250	2.51%	2.499	
<b>1959</b>	2.7276			18.25			17,467,500	1.15%	5.128	
<b>1960</b>	2.7500			18.48			17,855,250	1.23%	3.539	
<b>1961</b>	2.8565	14.414	0.06938	18.70	220.176	41.1730	18,224,500	1.22%	3.061	12,081.34
<b>1962</b>	3.0239	14.771	0.06770	18.87	236.740	44.6650	18,570,750	0.89%	4.477	12,748.02
<b>1963</b>	3.1361	15.293	0.06539	19.22	249.561	47.9610	18,919,000	1.86%	3.875	13,191.00
<b>1964</b>	3.3160	15.847	0.06310	19.57	268.564	52.5490	19,277,250	1.81%	4.042	13,931.65
<b>1965</b>	3.5971	16.105	0.06209	20.03	289.288	57.9300	19,633,500	2.34%	4.292	14,734.43
<b>1966</b>	3.8743	16.730	0.05977	20.78	311.875	64.8180	19,997,500	3.79%	5.167	15,595.69
<b>1967</b>	4.1888	16.639	0.06010	21.53	323.675	69.6980	20,363,750	3.61%	4.979	15,894.66
<b>1968</b>	4.2691	17.833	0.05608	22.39	339.997	76.1310	20,692,000	3.99%	6.792	16,431.33
<b>1969</b>	4.7133	17.785	0.05623	23.43	357.717	83.8250	20,994,250	4.65%	7.458	17,038.80
<b>1970</b>	4.9789	18.112	0.05521	24.21	372.512	90.1790	21,287,500	3.31%	7.125	17,499.11
<b>1971</b>	5.5635	17.692	0.05652	24.87	395.827	98.4290	21,747,314	2.72%	5.188	18,201.19
<b>1972</b>	6.3914	17.197	0.05815	26.08	421.392	109.9130	22,187,140	4.89%	4.750	18,992.61
<b>1973</b>	7.3540	17.535	0.05703	28.06	459.600	128.9560	22,453,775	7.57%	6.125	20,468.70
<b>1974</b>	8.3454	18.458	0.05418	31.13	494.769	154.0380	22,772,045	10.96%	8.500	21,727.02
<b>1975</b>	9.7236	17.856	0.05600	34.46	503.858	173.6210	23,102,980	10.68%	8.500	21,809.21
<b>1976</b>	10.9117	18.328	0.05456	37.06	539.673	199.9940	23,414,365	7.55%	9.292	23,048.82
<b>1977</b>	12.0083	18.402	0.05434	40.03	552.087	220.9730	23,694,035	8.01%	7.708	23,300.69
<b>1978</b>	13.4578	18.196	0.05496	43.61	561.537	244.8770	23,935,651	8.95%	8.979	23,460.28

<b>Year</b>	<b>M: MB</b> <b>Money:</b> <b>Monetary</b> <b>Base in</b> <b>billions</b>	<b>V</b> <b>= Y/M</b> <b>Income</b> <b>Velocity</b> <b>of M:</b> <b>Mon Base</b>	<b>k</b> <b>Cambridge</b> <b>cash</b> <b>balances</b> <b>k = 1/V</b>	<b>P</b> <b>CPI</b> <b>June 1992=</b> <b>100.00</b> <b>CANSIM</b>	<b>y</b> <b>Real GDP:</b> <b>in billions of</b> <b>1992 dollars</b> <b>CANSIM</b>	<b>GDP = Y</b> <b>Gross</b> <b>Domestic</b> <b>Product in</b> <b>billions</b> <b>current</b> <b>market</b> <b>prices</b> <b>CANSIM</b>	<b>Population</b> <b>Canadian</b> <b>population</b> <b>in millions</b>	<b>Inflation:</b> <b>Percent</b> <b>Change</b> <b>in CPI</b>	<b>Bank</b> <b>Rate</b> <b>in percent</b>	<b>Real GDP</b> <b>per</b> <b>capita</b> <b>in dollars</b>
<b>1979</b>	14.8698	18.802	0.05319	47.59	587.449	279.5770	24,170,445	9.13%	12.104	24,304.45
<b>1980</b>	16.0130	19.633	0.05093	52.43	599.695	314.3900	24,471,129	10.16%	12.891	24,506.22
<b>1981</b>	17.1964	20.962	0.04771	58.94	611.572	360.4710	24,785,059	12.43%	17.931	24,675.05
<b>1982</b>	17.4193	21.807	0.04586	65.31	581.639	379.8590	25,083,479	10.80%	13.958	23,188.15
<b>1983</b>	17.7398	23.190	0.04312	69.13	595.062	411.3860	25,336,505	5.86%	9.553	23,486.34
<b>1984</b>	17.9203	25.088	0.03986	72.11	623.481	449.5820	25,577,353	4.30%	11.312	24,376.30
<b>1985</b>	18.7576	25.894	0.03862	74.97	647.907	485.7140	25,813,854	3.96%	9.647	25,099.18
<b>1986</b>	19.9900	25.640	0.03900	78.10	656.262	512.5410	26,068,353	4.18%	9.214	25,174.68
<b>1987</b>	21.0964	26.495	0.03774	81.49	685.897	558.9490	26,399,956	4.34%	8.403	25,981.00
<b>1988</b>	22.2465	27.559	0.03629	84.79	723.059	613.0940	26,754,940	4.05%	9.686	27,025.26
<b>1989</b>	23.5343	27.948	0.03578	89.03	738.813	657.7280	27,219,748	4.99%	12.293	27,142.53
<b>1990</b>	24.4104	27.854	0.03590	93.27	729.008	679.9210	27,638,583	4.76%	13.045	26,376.44
<b>1991</b>	25.3470	27.039	0.03698	98.51	695.745	685.3670	27,987,829	5.62%	9.034	24,858.85
<b>1992</b>	26.7329	26.203	0.03816	99.98	700.655	700.4800	28,319,473	1.49%	6.783	24,741.11
<b>1993</b>	28.2746	25.719	0.03888	101.83	714.092	727.1840	28,648,235	1.86%	5.088	24,926.22
<b>1994</b>	29.2574	26.348	0.03795	102.00	755.758	770.8730	28,958,270	0.16%	5.766	26,098.17
<b>1995</b>	29.5420	27.433	0.03645	104.21	777.698	810.4260	29,262,649	2.17%	7.308	26,576.47
<b>1996</b>	30.1993	27.711	0.03609	105.85	790.613	836.8640	29,570,577	1.58%	4.531	26,736.48
<b>1997</b>	31.7384	27.813	0.03595	107.57	820.638	882.7330	29,868,726	1.62%	3.521	27,474.83
<b>1998</b>	33.5764	27.250	0.03670	108.63	842.258	914.9730	30,125,715	0.99%	5.104	27,958.11
<b>1999</b>	36.5423	26.885	0.03720	110.52	888.953	982.4410	30,369,575	1.73%	4.917	29,271.16
<b>2000</b>	38.1102	28.223	0.03543	113.53	947.357	1,075.5660	30,650,631	2.73%	5.771	30,908.24
<b>2001</b>	39.6666	27.919	0.03582	116.41	951.357	1,107.4590	30,973,522	2.53%	4.313	30,715.17

<b>Year</b>	<b>M: MB</b> <b>Money:</b> <b>Monetary</b> <b>Base in</b> <b>billions</b>	<b>V</b> <b>= Y/M</b> <b>Income</b> <b>Velocity</b> <b>of M:</b> <b>Mon Base</b>	<b>k</b> <b>Cambridge</b> <b>cash</b> <b>balances</b> <b>k = 1/V</b>	<b>P</b> <b>CPI</b> <b>June 1992=</b> <b>100.00</b> <b>CANSIM</b>	<b>y</b> <b>Real GDP:</b> <b>in billions of</b> <b>1992 dollars</b> <b>CANSIM</b>	<b>GDP = Y</b> <b>Gross</b> <b>Domestic</b> <b>Product in</b> <b>billions</b> <b>current</b> <b>market</b> <b>prices</b> <b>CANSIM</b>	<b>Population</b> <b>Canadian</b> <b>population</b> <b>in millions</b>	<b>Inflation:</b> <b>Percent</b> <b>Change</b> <b>in CPI</b>	<b>Bank</b> <b>Rate</b> <b>in percent</b>	<b>Real GDP</b> <b>per</b> <b>capita</b> <b>in dollars</b>
<b>2002</b>	42.3101	27.280	0.03666	119.03	969.716	1,154.2040	31,322,332	2.25%	2.708	30,959.24
<b>2003</b>	43.9059	27.700	0.03610	122.32	994.297	1,216.1910	31,626,552	2.77%	3.188	31,438.68
<b>2004</b>	45.2319	28.524	0.03506	124.56	1,035.808	1,290.1850	31,932,015	1.83%	2.500	32,437.91
<b>2005</b>	47.3058	28.991	0.03449	127.34	1,076.965	1,371.4250	32,258,138	2.23%	2.917	33,385.84
<b>2006</b>	49.6239	29.145	0.03431	129.90	1,113.400	1,446.3070	32,603,606	2.01%	4.313	34,149.61
<b>2007</b>	52.1695	29.436	0.03397	131.65	1,166.461	1,535.6460	32,881,904	1.35%	4.604	35,474.26
<b>2008</b>	54.4343	29.395	0.03402	135.78	1,178.445	1,600.0810	33,260,314	3.14%	3.208	35,430.97

<b>Money</b>	<b>Source</b>	<b>Definition</b>
Monetary Base	CANSIM	notes and coin in circulation, chartered bank and other Canadian Payments Association members' deposits with the Bank of Canada
M1	IMF	notes, coins, chequable deposits: narrowly defined
M1B	CANSIM	currency outside banks, chartered bank chequable deposits, less inter-bank chequable deposits
M1+ Gross	IMF	M1 broadly defined: notes, coins, chequable and other deposits; Canada Savings Bond and other liquid assets

**Money Supply, GDP, and Prices in Canada, 1955 - 2007: Annual Means of monthly data**

<b>Year</b>	<b>M1</b> Money: M1 narrow in billions IMF data	<b>V</b> = Y/M Income Velocity of M: M1 (MIF)	<b>k</b> Cambridge cash balances k = 1/V	<b>P</b> CPI June 1992= 100.00 CANSIM	<b>y</b> Real GDP: in billions of 1992 dollars CANSIM	<b>GDP = Y</b> Gross Domestic Product in billions current market prices CANSIM	<b>Population</b> Canadian population in millions	<b>Inflation:</b> Percent Change in CPI	<b>Bank Rate</b> in percent	<b>Real GDP</b> per capita in dollars
<b>1955</b>	4.7720			16.83			15,681,250		1.896	
<b>1956</b>	4.7610			17.07			16,070,250	1.39%	3.153	
<b>1957</b>	4.7880			17.60			16,579,500	3.12%	4.023	
<b>1958</b>	5.4200			18.04			17,062,250	2.51%	2.499	
<b>1959</b>	5.2330			18.25			17,467,500	1.15%	5.128	
<b>1960</b>	5.4990			18.48			17,855,250	1.23%	3.539	
<b>1961</b>	5.8510	7.037	0.14211	18.70	220.176	41.1730	18,224,500	1.22%	3.061	12,081.34
<b>1962</b>	6.0770	7.350	0.13606	18.87	236.740	44.6650	18,570,750	0.89%	4.477	12,748.02
<b>1963</b>	6.2960	7.618	0.13127	19.22	249.561	47.9610	18,919,000	1.86%	3.875	13,191.00
<b>1964</b>	6.6930	7.851	0.12737	19.57	268.564	52.5490	19,277,250	1.81%	4.042	13,931.65
<b>1965</b>	7.1300	8.125	0.12308	20.03	289.288	57.9300	19,633,500	2.34%	4.292	14,734.43
<b>1966</b>	7.7180	8.398	0.11907	20.78	311.875	64.8180	19,997,500	3.79%	5.167	15,595.69
<b>1967</b>	8.3550	8.342	0.11987	21.53	323.675	69.6980	20,363,750	3.61%	4.979	15,894.66
<b>1968</b>	8.9070	8.547	0.11700	22.39	339.997	76.1310	20,692,000	3.99%	6.792	16,431.33
<b>1969</b>	9.2410	9.071	0.11024	23.43	357.717	83.8250	20,994,250	4.65%	7.458	17,038.80
<b>1970</b>	9.7620	9.238	0.10825	24.21	372.512	90.1790	21,287,500	3.31%	7.125	17,499.11
<b>1971</b>	11.4840	8.571	0.11667	24.87	395.827	98.4290	21,747,314	2.72%	5.188	18,201.19
<b>1972</b>	13.1660	8.348	0.11979	26.08	421.392	109.9130	22,187,140	4.89%	4.750	18,992.61
<b>1973</b>	14.6350	8.811	0.11349	28.06	459.600	128.9560	22,453,775	7.57%	6.125	20,468.70
<b>1974</b>	15.4930	9.942	0.10058	31.13	494.769	154.0380	22,772,045	10.96%	8.500	21,727.02
<b>1975</b>	19.0380	9.120	0.10965	34.46	503.858	173.6210	23,102,980	10.68%	8.500	21,809.21
<b>1976</b>	19.3950	10.312	0.09698	37.06	539.673	199.9940	23,414,365	7.55%	9.292	23,048.82

<b>Year</b>	<b>M1</b> Money: M1 narrow in billions IMF data	<b>V</b> = Y/M Income Velocity of M: M1 (MIF)	<b>k</b> Cambridge cash balances k = 1/V	<b>P</b> CPI June 1992= 100.00 CANSIM	<b>y</b> Real GDP: in billions of 1992 dollars CANSIM	<b>GDP = Y</b> Gross Domestic Product in billions current market prices CANSIM	<b>Population</b> Canadian population in millions	<b>Inflation:</b> Percent Change in CPI	<b>Bank Rate in percent</b>	<b>Real GDP per capita in dollars</b>
<b>1977</b>	21.7090	10.179	0.09824	40.03	552.087	220.9730	23,694,035	8.01%	7.708	23,300.69
<b>1978</b>	23.6170	10.369	0.09644	43.61	561.537	244.8770	23,935,651	8.95%	8.979	23,460.28
<b>1979</b>	24.5860	11.371	0.08794	47.59	587.449	279.5770	24,170,445	9.13%	12.104	24,304.45
<b>1980</b>	27.2790	11.525	0.08677	52.43	599.695	314.3900	24,471,129	10.16%	12.891	24,506.22
<b>1981</b>	27.4590	13.128	0.07618	58.94	611.572	360.4710	24,785,059	12.43%	17.931	24,675.05
<b>1982</b>	28.4780	13.339	0.07497	65.31	581.639	379.8590	25,083,479	10.80%	13.958	23,188.15
<b>1983</b>	30.8670	13.328	0.07503	69.13	595.062	411.3860	25,336,505	5.86%	9.553	23,486.34
<b>1984</b>	31.0720	14.469	0.06911	72.11	623.481	449.5820	25,577,353	4.30%	11.312	24,376.30
<b>1985</b>	34.3750	14.130	0.07077	74.97	647.907	485.7140	25,813,854	3.96%	9.647	25,099.18
<b>1986</b>	36.6630	13.980	0.07153	78.10	656.262	512.5410	26,068,353	4.18%	9.214	25,174.68
<b>1987</b>	39.7930	14.046	0.07119	81.49	685.897	558.9490	26,399,956	4.34%	8.403	25,981.00
<b>1988</b>	42.5870	14.396	0.06946	84.79	723.059	613.0940	26,754,940	4.05%	9.686	27,025.26
<b>1989</b>	44.0600	14.928	0.06699	89.03	738.813	657.7280	27,219,748	4.99%	12.293	27,142.53
<b>1990</b>	43.6960	15.560	0.06427	93.27	729.008	679.9210	27,638,583	4.76%	13.045	26,376.44
<b>1991</b>	46.1710	14.844	0.06737	98.51	695.745	685.3670	27,987,829	5.62%	9.034	24,858.85
<b>1992</b>	49.1970	14.238	0.07023	99.98	700.655	700.4800	28,319,473	1.49%	6.783	24,741.11
<b>1993</b>	56.5290	12.864	0.07774	101.83	714.092	727.1840	28,648,235	1.86%	5.088	24,926.22
<b>1994</b>	60.9850	12.640	0.07911	102.00	755.758	770.8730	28,958,270	0.16%	5.766	26,098.17
<b>1995</b>	65.5270	12.368	0.08086	104.21	777.698	810.4260	29,262,649	2.17%	7.308	26,576.47
<b>1996</b>	77.9190	10.740	0.09311	105.85	790.613	836.8640	29,570,577	1.58%	4.531	26,736.48
<b>1997</b>	86.4950	10.206	0.09799	107.57	820.638	882.7330	29,868,726	1.62%	3.521	27,474.83
<b>1998</b>	93.6230	9.773	0.10232	108.63	842.258	914.9730	30,125,715	0.99%	5.104	27,958.11
<b>1999</b>	101.1830	9.710	0.10299	110.52	888.953	982.4410	30,369,575	1.73%	4.917	29,271.16

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<b>2000</b>	116.1030	9.264	0.10795	113.53	947.357	1,075.5660	30,650,631	2.73%	5.771	30,908.24
<b>2001</b>	133.8580	8.273	0.12087	116.41	951.357	1,107.4590	30,973,522	2.53%	4.313	30,715.17
<b>2002</b>	140.1970	8.233	0.12147	119.03	969.716	1,154.2040	31,322,332	2.25%	2.708	30,959.24
<b>2003</b>	153.7390	7.911	0.12641	122.32	994.297	1,216.1910	31,626,552	2.77%	3.188	31,438.68
<b>2004</b>	170.1790	7.581	0.13190	124.56	1,035.808	1,290.1850	31,932,015	1.83%	2.500	32,437.91
<b>2005</b>	188.7220	7.267	0.13761	127.34	1,076.965	1,371.4250	32,258,138	2.23%	2.917	33,385.84
<b>2006</b>	215.3450	6.716	0.14889	129.90	1,113.400	1,446.3070	32,603,606	2.01%	4.313	34,149.61
<b>2007</b>	226.3917	6.783	0.14742	131.65	1,166.461	1,535.6460	32,881,904	1.35%	4.604	35,474.26

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