



AMERICAN UNIVERSITY OF BEIRUT

A MODEL OF INTERNATIONAL TRADE BETWEEN A SMALL  
COUNTRY ON A STRICT GOLD STANDARD AND COUNTRIES  
UTILISING FIAT CURRENCIES

by  
NAMIR MAKRAM SUIDAN

A thesis submitted in partial fulfilment of the requirements  
for the degree of Master of Arts  
to the Department of Economics  
of the Faculty of Arts and Sciences  
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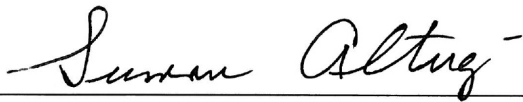
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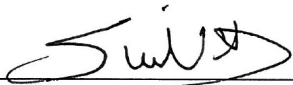
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# AN ABSTRACT OF THE THESIS OF

Namir Makram Suidan for Master of Arts

Major: Economics

Title: A Model of International Trade betwixt a Small Country on a Strict Gold Standard and Countries Utilising Fiat Currencies

We model a scenario of international trade betwixt a small country on a strict gold standard, in which all domestic market goods are purchased using solid gold currency, under simplifying assumptions. Then we apply to the model both an historically-viable valuation for the small country's domestic gold currency, and a modern-day gold-to-fiat bullion exchange ratio, to determine whether or not this small country would stand at a theoretical advantage. We find that the gold currency is of much higher purchasing power value than the rival fiat currency in such a setting and therefore the country has a clear advantages in the imports sector; overall advantage is contingent on maintaining a relatively small export amount. Indeed, so long as the ratio of exports (priced in gold) to the sum of the prices of imported goods, in fiat terms, is greater than the exogenous gold-to-fiat ratio, then the small country in question should have a distinct dynamic advantage in international trade.

Furthermore, we investigate the effects of exogenous price inflation situated in the fiat currency-utilising trading partners and determine that, at least in the short run, exogenous nominal price inflation is to the clear advantage of the small gold standard-utilising country.

Also, we review the history of metallic standards up until the end of the Bretton-Woods Agreement, and the development of banking, and we scrutinise the role of gold bullion within the modern fiat regime, including its efficacy as an inflation hedge.

We finish with suggestions for future research that consider modern bullion market phenomena, and potential improvements upon the model's simplifying assumptions.

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# Chapter I

## INTRODUCTION

In the grand scheme of economic history, the complete absence of gold and precious metals as fundamental constituents of the monetary systems of nations is a comparatively recent phenomenon. With the advent of fiat currencies, we seem to be in a stage of monetary history unprecedented in constitution, in which gold is not a basis of common currency but rather a commodity.

One may venture to pose a question: given the comparatively brief chronicle of fiat currency dominance, what would happen if a small country reverted to a strict gold standard, in which all tradable goods are priced in terms of weights of gold, delineated by a standard, minted coin, or set thereof, just as in past societies? Further, one may ask: How would such a nation fare if all its competitors and trading partners remained beholden to the fiat standard, just as governments are today?

We proceed to model such a nation, which we call ‘Gold Country’, in order to ascertain whether or not a small nation (or, alternatively, a city, community, or other small socio-geographic unit) on a strict gold standard would be in an advantageous trading position if its trading partners, without exception, were to remain on the ‘fiat standard’, given an exogenously-determined gold-to-fiat currency exchange rate (exogenous with respect to the Gold Country, that is).



This is to ask, would the Gold Country be at a trading advantage over the fiat currency-utilising nations (which, for brevity, we term ‘Fiat Nations’) simply by virtue of its alternate (and historically-precedented) monetary system? The answer, as we have found, is that, given the assumptions of the model, so long as the ratio of exports to import prices is greater than the exogenous gold-to-fiat exchange rate, Gold Country is at a distinct theoretical advantage. Furthermore, historical trends of continuously positive nominal inflation in Fiat Nations and gold’s tendency to reflect nominal inflation in its pricing clearly favour the Gold Country, at least in the short term.

Then, in order to judge the feasibility of modern-day success for the Gold Country, we proceed to calibrate, anachronistically, Gold Country’s hypothetical currency by means of a historically-valid value for real gold purchasing power. Then, using a modern-day fiat-to-gold price ratio of 1300 Federal Reserve Notes (dollars) to one ounce of gold, we endeavour to determine whether Gold Country would likely be successful in trade if juxtaposed in a modern, real-life setting. The answer according to this paper’s findings is a yes, if a comparatively low minimum export level can be maintained, despite the Gold Country’s stronger currency.

The primary methodology in deriving the model is to base it on micro-foundations, with a dynamic wealth equation involving imports and exports, coupled with a utility function.

Following this introduction, we proceed to provide a background concerning the changing state of monetary gold in society and research regarding the gold standard; and we provide a brief history of gold (and precious metal) usage in general, pointing to its long-standing societal usage, the development of gold (and metallic) standards of worth in various

societies, and the development of the classical gold standard which decisively ended with the termination of the Bretton-Woods Agreement.

Next, we state the assumptions of the model, showcase the subsequent derivations, and delineate and interpret the results and their implications. Having explicated the model and its implications, we adopt a particular historical gold valuation for Gold Country so that we may apply to the model both a historically-viable gold currency value in fiat terms and a contemporary gold-to-fiat price ratio. Following this is a discussion of the overall favourability.

Prior to concluding, we make suggestions concerning possible directions of future, related research.

## CHAPTER 2

### BACKGROUND

With the end of the Bretton-Woods system in 1971, the world has largely maintained a floating fiat currency regime in which a dominant fiat currency or a basket thereof acts as a reserve currency against which others are measured (Hammes et alii, 501-7). This present system, in contrast to previous regimes, videlicet, the strict metallic standards of pre-modern history, the classical gold standard of the 19th and 20th centuries, and the multifaceted, postbellum Bretton-Woods system, disregards an intrinsic valuation of gold currency in the formulation of its national monetary systems and allows what is perceived as floating fiat exchange rates betwixt the many national fiat currencies of the world to fluctuate daily, not to mention a vacillating gold bullion price that is also measured in these fiat currencies (Selgin, 1, 17-19).

In fact, the place of gold in modern economics is largely relegated to hedging against the deficiencies of the fiat system; namely, the upward trend of nominal inflation and the consequent, consistent devaluation, in real terms, of the fiat currencies. A self-fulfilling belief in gold's price stability against inflation substantiates its role as an inflation hedge, a property which may not be, in effect, universally adhered to by financial investors at all times, but which seems to have predominated among the financial investors of the United States (Chua et alii, 191).

Yet, prior to this modern fiat regime, gold has throughout the history of human civilisation served as a currency itself (but not in every single society), and later as a value standard of representative banknotes (often formulated with convertibility), the issuance and circulation of which led to the economic phenomenon known as the money multiplier effect of bank lending which in turn contributes to the inflation-laced system that we witness presently in the form of the national (as opposed to private and variegated) paper bank note fiat currencies which are not supported by gold convertibility (Ferguson, 19-20, 44, 52, 54, 56).

Research on the topic of the historical gold standards, numismatics, and the historical transition into the modern fiat regime is abundant, detailed, and variegated. However, detailed mathematical models concerning the gold standard, including the effects of supply shocks and other pertinent phenomena, are not as abundant (the gold standard model of Chappell and Dowd, which takes into consideration supply shocks and the physical supply of gold, being a notable exception) (Chappell et alii, 94). Furthermore, studies concerning trading competition betwixt different monetary regime economies, specifically, those of fiat and those of gold persuasion, are lacking. There seems not to be an impetus to research the interaction betwixt the fiat and the gold regimes, perhaps due to the clear, recent historical trend toward ubiquitous fiat usage and the sheer exiguity of gold-supported monetary systems in post-Bretton-Woods times (Selgin, 19-21).

The prospect of an instauration of gold as a fixity in modern national monetary systems, while championed by a notable minority of politicians (Lehrman et alii, 143-94; Selgin, 19), financial advisors (Maloney, 9-10, 46-9), economists (Selgin, 19-21), religionists (Islahi, 81-83), and still others, is not treated by the mainstream as a practical, possible alternative to the modern

system, and is thusly largely ignored except to some extent in these circles (Selgin, 19-21). So, it is understandable that there is a dearth in the economics literature concerning an interplay betwixt the two systems - studies on the interplay between gold and fiat in general are largely limited to bullion's role as an hedge in investment strategies within fiat economies (O'Connor et alii, 1-2) - in spite of the fact that the modern, international fiat regime is of so short a time interval historically that it can hardly be averred to be unquestionably stable, or natural, nor can one be justifiably confident that it is to be perpetually employed as the universal, world-wide system prospectively.

Indeed, the reversion of a minority, or even a majority, or even the entire world's nations to time-tested metallic standards is not impossible nor far-fetched if a mature historical perspective is to be adopted. Actual attempts to do this within a fiat currency-utilising nation are often stifled, since they challenge the authority of the national treasury. Instead, we imagine national conversion processes; and from hence we have the impetus of this model, id est, to see what may happen in a phase in which both systems exist simultaneously on trading terms.

### **A. A Brief History of the Gold Standard and Gold Valuation**

Prior to describing metallic and fiat currency systems, let us touch upon the more fundamental bartering system. While barter was a mainstay of economic life in many periods of recorded history, and more rarely is at present, one economic historic viewpoint is that the method of bartering in the absence of metallic or fiat currency became too tenuous as economic life became more complicated. From a small set of highly preferred bartering goods arose, for the sake of media of exchange, commodities, the advantages and features of which included

requisite availability, durability, portability, and “high value densities” (Davies, 10). Even without metallic money, marketplaces concentrated in particular locations under barter conditions. Davies avers that in the historic ascendancy of currency as the medium aspect of economic society, “the logical sequence (barter, barter plus primitive money, primitive money, primitive plus modern money, then modern money almost exclusively) has also been the actual path followed, but with occasional reversions to previous systems” (11).

The primary shortcoming of the pure barter system is the lack of standardised values for goods by which one may relate all purchasable goods to each other. This deficiency, coupled with the sheer impracticality of the “double coincidence of wants required to complete an exchange of goods or services” seems to have stimulated the advent of commodity currencies, especially as economies became more complex and the standardisation of value became highly useful for gross economic welfare. Similarly, the need for an efficient and standardised method to measure and store wealth in these more complicated societies substantiates the historical and ubiquitous rise of commodity currencies (15-7).

Indeed, we must not initially assume that all societies in history have used a gold or even a metallic standard prior to the modern advent of fiat currencies (Ferguson, 19-20), which themselves originated as convertible paper representations of metallic currency (44, 52, 54, 56). Indeed, many small societies, such as those of hunter-gatherers, never embraced metallic currency (for example, the Nukak-Maku of the Amazon region); even the sprawling Inca empire never adopted metallic specie as a method of trade, for their currency was a unit of labour (19-20). (Ironically, the unflagging international Spanish search for precious metal ore led to the destruction of that empire (20-1).) So, obviously, we do not consider such civilisations in a

historical analysis of gold's place in monetary systems. Simultaneously, we are confined to those societies which used metallic currency and about which there is anthropological data concerning its purchasing power or similar societal value. We shall mention just a few examples in order to sketch a background.

In reviewing literature pointing to an intrinsic, historically-viable, real value of gold, we find that anthropological research regarding baskets of goods purchased by a certain weight of gold within some historical timeframe, while sometimes available in research on some civilisations (or political entities) and historical periods, is frequently not. Nevertheless, there are some sources that provide specific information concerning coinage laws and judicial punitive fees priced in metallic currency that serve to adumbrate what gold weight was worth to those societies, in terms not only of marketable goods but also in legal injunctions. These insights are generally from scriptural and legal sources in the historical cultural research of different civilisations. From thence we begin to adumbrate the interpretation of an intrinsic value of gold.

For particular ancient societies, we may consider legal stipulations in terms of precious metals instead of valuations of common goods, about which anthropological research may be scarce. Take, for example, the Laws of Manu (also known in English as the Institutes of Manu), an ancient scriptural canon of laws featured in the Vedic religion and culture dominant in the region generally considered as northern India today. In this document, we have clear stipulations of coinage weights, payment norms, and legal fees that provide insight as to just how much a weight of metals was valued by the practitioners and promulgators of the Vedic religion and the peoples under their aegis and guidance. In the document, legal amercements are stipulated to be of three levels, lowest, middlemost, and highest; their weights, respectively, defined as the

weight in silver of 5000 of a certain bean (called *māśa* in Sanskrit), of 10000, and of 20000 (Buhler, 48).

The ancient Romans minted the solidus gold specie, which, even after the fall of the Roman Empire, remained in usage in Medieval Europe (a fact which attests to the physical property of gold, perdurability, that is so esteemed in its function as currency) (Emerton, 88). Indeed, according to financial investor Michael Maloney, the poor state of the Roman economy circa 280 anno domini in which coinage was relegated to relatively worthless copper and bronze led the then-emperor of Rome Diocletian to further debase the Roman coinage: “All this led to the world’s first documented hyperinflation”, in which, “the price of gold rose 42,400 times in fifty or so years...and the economic system reverted to a barter system” (10-1).

After the fall of Rome, during the period known as the Middle Ages, the Germanic legal practice of *wergeld*, which varied from tribe to tribe in its particulars, and which might be called “blood money” today, established set norms, often understandable in terms of this Roman specie, which likewise renders insight, albeit of a more social kind rather than a strictly economic, marketplace sort, in depicting the value of metallic currency. Keeping in mind a modern numismatic estimated weight value of the Roman solidus gold coin of 4.5 grammes (Dam, 3), Emerton provides the following insight into some Germanic tribes’ gold valuations and legal conventions:

The *wergeld*, like all other values, was reckoned in shillings (*solidi*), an amount which we cannot estimate with any great certainty; but we may form some idea of how much a man was worth from the fact that in the law of the Alemanni a



first-rate cow was worth one solidus and two-thirds, while the wergeld of a freeman was two hundred solidi. According to the Salic law the ordinary Frankish freeman was worth two hundred, and the ordinary Roman landholder one hundred; but if these were in the special service of the king (*trustis*), their wergeld tripled. The Frisian noble was worth eighty shillings; the freeman, fifty-three shillings and one penny; and the serf (*litus*), twenty-seven less one penny. (88)

A cow's being worth a calculated 7.5 grammes of gold is quite insightful. If a first-rate cow is worth  $x$  Federal Reserve Notes today, while 7.5 grammes of gold is worth approximately 350 Federal Reserve Notes at a price of 1300 per ounce, then if  $x$  is greater than 350, we may assert that the purchasing power of the fiat currency is less than that of the Roman gold currency in the time period described above; conversely, if less, then perhaps we may aver that the dollar's purchasing power is greater than that of this historical valuation. Indeed, the former is much more likely today. Meanwhile, the legal pricing of human life may be more complicated to translate into common good values in gold, but nevertheless such calibration serves to sketch more vividly the essential worth and estimation of metallic currency in ancient societies.

Fortunately for the purposes of this model, we have a rather comprehensive calibration of the gold dinar of the early Islamic empire (circa 700-1200 anno domini) in modern currency provided by Zarra-Nezhad. The geographic and temporal dominance, outward expansionistic trends, and general economic prosperity of this civilisation make it a rather attractive historical example in finding the market values of gold weight in real terms, and translating said values to

modern currency; according to Zarra-Nezhad, "...there were no marked changes in international trade so that, over the long term (excluding periods of famine and inflation), the costs stayed unchanged. Accordingly, we can with some confidence ignore temporary aberrations and get the information needed for our comparison" (59). These research limitations, as adumbrated by the author, are four-fold: that prices must be inferred and adjusted for inflation based on what information is available; that technological production methods of that time period are different in many respects from those of the modern; that the value and quality of even the same goods varies with time; and that mainly animal transport was utilised in that era (58-59).

Specifically, Zarra-Nezhad's calibration is a range value of 32.5-36.5 United States Federal Reserve Notes, priced during circa 2004, for one dinar of an estimated 4.25 grammes of gold (1). The early Islamic civilisation's various governors utilised two main coinages, one in silver, the dirham, whose weight varied slightly by administration, but which is averaged at 2.275 grammes of silver, and the other in gold, the dinar (53-56). They often instituted fixed exchange rates of 10 to 13, and even up to 22 pieces of the silver specie to the gold; these variations in exchange rate are primarily due to metallic supply shocks, mainly of silver. These shocks reached a peak with the discovery and importation of so-called New World silver into the so-called Old World (63).

To arrive at this calibration, the author gathered and interpreted anthropological research of the prices of two baskets of common, mainly dietary goods and one set of service wages; videlicet: in basket A, one kilogram each of wheat, meat, broad bean, date, and salt, and one suit were considered; in basket B, one kilogram each of rice, oats, oil, almonds, and honey, as well as 30 eggs; in basket C, the basket of service wages, the daily wages of an architect, a bricklayer, a

carpenter, a mud worker, a farm hound, and a dress-maker (59-62). Given the smaller denomination of the silver dirham as opposed to the dinar, these common goods and wages were determined in dirham values, then translated to dinar, then to modern Iranian currency, id est, Riyal, values, then to United States Federal Reserve Note values via the fixed Riyal-to-Dollar exchange rate of the time of publication (the year 2004) (64).

As we shall make particular usage of Zarra-Nezhad's findings in our model's application, it is useful to heed them here.

## **B. Banking and the Advent of the Classical Gold Standard**

Moving on from the early Islamic Empire, we note that circa 1400 the Medici family of Florence, Italy, was on the rise. The time period's innovations in money lending featured *cambium per literas*, or bills of exchange, which arose in the merchant dealings of the Dark Ages of Europe, and which presage the advent of the modern fiat currency, as these bills, which were levied by the creditor upon the debtor, could be used as methods of payment in their own right if official metallic specie was unavailable upon the demand of payment. The subsequent enormous political and financial power of the Medici family members attests to the success of their banking methodology coupled with their meticulous note-keeping techniques (Ferguson, 42-48).

From Medici's innovations eventually came the establishment of European central banks and their precursors. Indeed, in the year 1657, the first centralised bank with the express purpose of credit creation, making full use of what is now known as "fractional reserve banking", was established in Stockholm, and in which metallic reserves practically never equalled lent amounts

(50). Later in England, the central Bank of England was granted full monopoly on note issuance - a truly powerful status - and began to have authority concerning inter-bank transactions (55).

Then, “the classical gold standard emerged as a true international standard by 1880 following the switch by the majority of countries from bimetallism, silver monometallism, and paper to gold as the basis of their currencies” (Braga de Macedo et alii, 15). During this period of a so-called ‘classical gold standard’, nations experimented with various convertibility schemes, but “...exchange rates throughout the 1880 to 1914 period were characterised by a high degree of fixity in the principal countries. Although exchange rates frequently deviated from par, violations of the gold points were rare...” (16).

The United States of America in particular did not quickly follow suit in the establishment of powerful central banking, but its monetary system did prominently feature bank notes that held credit, and not just a small number; according to Lewis:

After 1870, governments typically replaced this myriad of currency issuers with a single monopoly issuer, the central bank, along the lines of the Bank of England, which became an effective currency monopolist in 1708. The United States was a laggard in this trend. The Federal Reserve was not established until 1913, and did not enjoy an effective currency monopoly until the 1940s. Although the Federal Reserve Note soon became ascendant, there were 5,389 commercial banks in the United States, even as late as 1930, that reported to the Office of the Comptroller of the Currency that they were issuing their own

gold-based banknotes within the framework of the National Bank System.

(299)

Indeed, bimetallism prevailed in the United States, whose system featured a fixed weight exchange rate between silver and gold; actually, until the advent of the classical gold standard regime of the 1880s, most countries either utilised a silver standard or a bimetallic standard (Braga de Macedo, 14).

The First World War that began in 1914, led, as wars often do, to suspension of monetary certainty and fixedness, and convertibility of notes to gold specie was largely suspended until 1926; and “the interwar gold exchange standard was a much less successful application of the specie standard rule” than that of 1880 to 1914 (Braga de Macedo et alii, 18). Indeed, in 1924, famous economist John Maynard Keynes “famously dismissed the gold standard as a ‘barbarous relic’. But the liberation of bank-created money from a precious metal anchor happened slowly”. The proverbial nail on the coffin occurred in 1971, with the end of the Bretton-Woods system, when American president Richard Nixon stopped the capacity of dollar-holders from obtaining gold specie on demand (Ferguson, 59).

### **C. The Modern Fiat Monetary System**

The fiat paper currency monetary system - its advent being a rather gradual 20th-century process but patently beginning in 1971 - which is at present a practically universally utilised system, entails the use of paper notes declared to be legal tender by the issuing government or

related banking entity, and which may not be converted at a government-declared price, on demand, for gold, silver, or another standardised commodity. Clearly, the paper it is printed on is intrinsically of such little value that the fiat currency does not stand by itself as a commodity, its value lying instead in its government-backing and the popular confidence in said backing. In comparing the traditional metallic standard systems to the modern fiat, Redish opines: "...there seems to be a vast chasm between a commodity money system, where the quantity of money is determined by nature (possibly at some remove) and the value of money is intrinsic, and a fiat money system, where the determinants of value are puzzling and the quantity of money is a matter of policy" (Redish, 777-8). Indeed, the fundamentals of the two systems differ widely, and the great majority of modern academic macroeconomic analysis implicitly assumes the fiat currency system fundamentals due to the necessity of analysing modern economic phenomena.

In the cases of the major national economies during this regime, there is a central bank with monopolistic authority to print denominations of the national (or international, in the case of the economic currency unions, notably the Euro Zone) paper currency in quantities it sees fit, with specific governmental regulation technically varying from nation to nation. In the United States, in particular, the federal government granted effective fiat printing monopoly to its central bank, the Federal Reserve System, in 1940 (Lewis, 299), despite the fact that the United States' Constitution, the foundational document of the American legal system, expressly "forbids that anything except gold and silver coin should be made a tender in payment of debt" (Lehrman et alii, x). Such was the juggernaut of fiat currency usage that was to become the worldwide politico-economic norm and that has lasted to the present day - that even centuries-established traditions of metallic currency usage and the laws enshrining them were abandoned and

circumvented in the transitional time period, and in practically every nation at that, in favour of paper fiat currency of comparatively murky economic foundation.

As in the case of the European Central Bank, the hierarchy of modern banking conglomeration includes over-arching central banks which may possess authority over those national banks who are its subscribers. The World Bank (also known as the International Bank for Reconstruction and Development) and the International Monetary Fund, plans for the latter of which were compiled in the United States as early as 1943, are other such examples (Redish, 789). Both founded in 1944 in Bretton-Woods, New Hampshire, they are a direct consequence of the inception of the Bretton-Woods Agreement (Hammes, 503). Of interest in analysing the development of the international break from gold and subsequent adoption of fiat currencies is the fact that “current IMF rules (effective April 1, 1978) forbid all reference to gold in defining currency values” for its member nations. In fact, its definition of currencies depends on relating one fiat currency to another, in a sort of cyclic manner, with the American dollar usually considered the strongest of the set (Lehrman et alii, 139). The emptiness of a solid definition of what precisely a (non-convertible fiat) dollar is causes this methodology to falter under scrutiny (180).

Monetary policy, in which, by means of the tools of bonds and the money printing press, the issuance and overall supply of money is manipulated so as to have an intended macroeconomic effect, is a mainstay of centralised national banking during this fiat era (Handa, 667-70). Indeed, the predominant positive nominal inflation pattern in the modern era’s major economies, which has led to diminishment of their fiat currencies’ purchasing power over time,

and a subsequent long-term rise in the market gold price (according to Levin and Wright, cited in O'Connor, 39), is a concomitant feature of the central banks' policy-making regime. Further complicating the matter is that, in the short term, expected inflation and other expected results of (announced or known) monetary policies play a role in price adjustment in the marketplace (Rasho, 22).

We may note that the markedly independent and authoritative power that central bankers enjoy today with respect to policy-making became robust after the official discontinuing of dollar convertibility in 1971; the ensuing volatility in currency exchange rates, the acceleration of inflation, and concurrently high international unemployment allowed American central bankers to capitalise upon the seeming disarray and to consolidate economic authority, wresting it more fully away from politicians. Economist Milton Friedman's so-called "monetarist" approach to macroeconomics was readily adopted by Federal Reserve Chairman Paul Volker in the 1980s, and the latter's perceived policy successes subsequently influenced the trend of central banks internationally towards independent policy making (Economist, 27-9).

The control over nominal prices and the tendency towards inflation volatility post-Bretton-Woods led central bankers internationally, in the period of the 1990s and after, to adopt inflation-targeting regimens whereby inflation is to be contained at desired levels (Petursson, 18-9). In comparing pre-inflation-targeting monetary policies with post-, international inflation percentages have been halved (23). It would seem that in this new monetary era a degree of adaptation on the part of political economists and policy-makers had to take place, and is taking



place, to deal with the characteristics of purely fiat monetary economics, especially more volatile, generally positive inflation.

#### **D. Gold Bullion as a Hedge Against Inflation in the Modern Fiat Regime**

In the modern fiat era, gold has, in a sense, been relegated to the status of an inflation hedge among financial investors. The field of financial economics features theories regarding investment in assets with very low variance: by diversifying a portfolio, the poor performance of one asset can be offset by the better performance of another (Copeland et alii, 118).

Furthermore, some assets are often regarded as ‘riskless’, implying that these assets’ returns are of very low statistical variance; id est, these assets may be depended upon to garner a certain expected return over time. Often, in theoretical calculation, their expected return is a constant (171). In view of the theory of the riskless asset, if one were to seek to safeguard his real wealth (id est, wealth defined by purchasing power) in a portfolio, he would necessarily need to fend off the depletion of wealth due to nominal inflation, which is exogenous. A sort of risk-free asset (as risk-free as reality permits) which is especially in use with reference to thwarting the siphoning of real wealth from a portfolio due to nominal price inflation, is known as an inflation hedge.

These hedge assets are theorised to be a means by which financial economists may combat inflation and guarantee a certain real, expected gain over time. Typically, gold, silver, oil, certain nations’ treasury bonds, and even some paper currencies such as the Euro, have, in modern (post-Bretton-Woods Agreement) times, been considered proper hedges against nominal price

inflation, as their rises and falls have been expected (and shown) to follow general trends in actual and expected inflation over time, at least in the United States (Worthington et alii, 259).

Indeed, gold is a rather popular and well-known choice for financial economists to keep – in certain, calculated proportions – within portfolios in order to offset inflation and whatever other (negative) shocks gold is expected to withstand as a wealth-preserving asset; for, in terms of purchasing power, gold is regarded as relatively constant in real value by many economists and researchers (Worthington et alii, 259).

This pro-gold stereotype among financial investors is, however, challenged as being too focused on the American investor and inapplicable to other nations' investors, at the least within the five-year period from 1975 to 1980, by Chua and Woodward. They indeed aver that the effectiveness of gold as an inflationary hedge is statistically agreeable in only one of six countries studied, to wit, the United States of America. According to the authors, investors of Canada, Germany, Japan, Switzerland, and the United Kingdom during that same time period did not experience a similar unequivocal benefit from gold as a hedge against inflation as investors of the United States did, raising serious questions as to the validity of the professional assumption that gold is a true, universal hedge against nominal price inflation (Chua et alii, 195-6). Nevertheless, the belief in modern financial economics that gold is an effective hedge has a plethora of supporting research, especially due to the close, direct relationship between the fiat price of gold and nominal inflation (Barro, 85-90; Worthington, 259).

A number of influential modern financial advisors encourage the purchase of gold and silver bullion in the United States due to fears of quantitative easing by the Federal Reserve Bank and the subsequent anticipated augmentation of gold's nominal fiat price (Maloney 27-9);

indeed, the yearly average price of gold in dollar terms has jumped from 278.86 dollars per ounce in 1999 to 973.66 in 2009 to 1302.94 as of 15 April 2019 (Macrotrends).

### **E. Econometric Inquiry Concerning the Correlation Between Inflation and Gold Prices**

Here we shall cite and report econometric results describing the statistical correlation between gold prices and nominal inflation. We shall begin with Worthington and Pahlavani's results.

Worthington and Pahlavani utilise econometric cointegration analysis with, importantly, allowance for structural breaks in analysing the correlation between gold prices and the United States' inflation rate on a monthly basis; they use two overlapping data samples - the first spanning 1945 to 2006 and the second 1973 to 2006. They chose this data division to allow for structural breaks; *id est*, during the first period, the Bretton-Woods Agreement was formulated and broke down in the middle at 1971, and in the latter, the focus is on post-Bretton-Woods analysis. Indeed, the primary structural breaks pinpointed by the authors are due to a pair of oil crises in 1973 and 1979; specifically, January 1973 and December 1978 are the monthly data points representing a suggested structural break for gold, and, for inflation, February 1973 and January 1979. This adjustment for shocks due to structural change is wise in analysing the cointegration relationship, as endogenous structural changes are likely to cause bias in time series econometric findings, and clearly the monetary system's fundamental structural changes with respect to metallic usage over the time period measured influences the fundamentals of the gold market and hence the price (Worthington *et alii*, 260).

In formulating their regression, they assume a single structural break and follow the Zivot Andrews model of 1992, which “accommodates the possibility of a change in the intercept as well as a broken trend” (260). Worthington and Pahlavani use a maximum likelihood approach in order to determine the relationship between the two variables, whereby, upon testing, they found that for both periods the cointegration relationship between inflation and gold prices is statistically significant, with the regression in both periods likely to feature not only an intercept but an orthogonal trend.

They themselves summarise their econometric results as follows:

...there is abundant evidence of a stable long- run relationship between the price of gold and inflation in both the post-war and post-1970s period as long as allowance is made for significant structural changes in the US gold market and US inflationary regimes in 1972/1973 and 1978/1979. Put differently, since the long-run price of gold and inflation move together, investment in gold can serve as an inflationary hedge. (261)

So, considering trend disruption due to structural breakages with respect to inflation and gold, Worthington and Pahlavani corroborate investor confidence in the efficacy of gold bullion as an inflation hedge in the modern fiat regime. Indeed, this confidence is more pronounced in long-term investment, as other studies adumbrate.

Lucey, Sharma, and Vigne “find evidence for a time-varying relationship in cointegration between gold and both predicted and realised inflation in nearly all cases. Contrasting multiple inflation indicators, [they] find evidence for the importance of money supply in the gold/inflation relationship” (Lucey et alii, 1). The authors use data spanning 1974 to 2014, including three measures for inflation, Consumer Price Index, official inflation, and Producer Price Index. Also, they examine the cointegration relationship between gold prices and money supply. Indeed, the authors aver that money supply augmentation is the root of inflation, and hence more authentic a measure in analysing the gold-inflation relationship (14). Their methodology focuses on the nations of Japan, the United States, and the United Kingdom, utilising their domestic currencies severally in measuring gold prices (9-10).

Using a Johansen Test to check for cointegration and that of Dickey and Fuller for integration (10), they found that in the United States during the 1990’s, when gold prices were very low, gold price cointegration ceased with official inflation data; indeed, it is not until 2012 that the official inflation figures cointegrate with gold prices again; not until approximately 2008 when using the CPI and PPI data (13-14). Concerning the money supply correlation, however, “gold is cointegrated with US liquid money throughout the whole sample” (14).

They found a gold-inflation cointegration relationship for the United Kingdom throughout the forty year period using British inflation figures. The authors conclude that, for the British, gold was a long-term hedge against inflation but not a short-term one, not even during times of economic crisis (15-16).

For Japan, the results are more scattered, with correlation of gold price with CPI ceasing in 1985 and afterwards; indeed there was a negative relationship between the years 1992 and 2015. Surprisingly, gold price was never cointegrated with the Japanese money supply figures throughout the entire period. With PPI, cointegration ceased in the late 20th century until circa 2008, the recent financial crisis (16). The authors conclude that for the Japanese investors, gold is not an efficacious hedge against inflation (17).

This discrepancy of findings with respect to nation generally corroborates the earlier findings of Chua and Woodard (mentioned above), who analyse only the very beginning of this forty year period and describe the dissimilarities in overall advantageousness of gold as an inflation hedge with respect to the different (major economic) nations' investors' portfolios (Chua et alii, 1). It would seem that, among the major economic nations of the modern monetary era, gold's hedging potential against inflation and money supply changes applies most robustly to investors in the United States.

Indeed, gold's hedging prowess even in the United States, though, is again found to be contingent upon whether the investment is short- or long-term by Naser, who finds that "gold investments in the US provide an effective hedge against inflation for investors who are willing to keep their investments for long-run. However, it does not provide any hedge if investors hold it for only short-term" (470). Using CPI as the measure for inflation, and timeframe 1968 to 2016, Naser tests a logarithmic regression, also using a Johansen Test, to determine that the cointegration relationship between the variables both exists and that that implies a long-run

equilibrium relationship; Naser also corroborates the findings of Lucey et alii that there is break in cointegration within the period (472-3).

Beckmann and Czudaj corroborate the findings of Lucey et alii in studying the same three countries and the Euro Area in addition. Using the CPI and PPI as measures, they generally conclude that gold is a better hedge in the United States and the United Kingdom than in Japan and the Euro Area. Also, they reaffirm that the time window of the investment is crucial to the success of gold as a hedge against inflation. Furthermore, they emphasise that discrepancy must be drawn between crises times and more regular times, echoing Worthington and Pahlavani's insistence to allow for structural breaks (3).

Gold's function as a hedge for inflation is clearly indicative of the relationship between fiat currency and traditional currency during this modern fiat regime. Hence, these studies delineating a general long-term correlation, at least for a sizeable party of the major modern economies, serve to bolster our awareness of the modern perspectives and economic fundamentals relating the two forms of currency.

## CHAPTER 3

# MODELLING A SCENARIO OF INTERNATIONAL TRADE BETWIXT A SMALL COUNTRY ON A STRICT GOLD STANDARD AND COUNTRIES UTILISING FIAT CURRENCIES

### A. Assumptions of the Model

We assume the existence of an international trading community of which the Gold Country is a member. Let it be restated that Gold Country's monetary system is a strict gold standard in which every item available domestically for purchase is priced in units of gold – every item from a sandwich to a home is priced and payable in terms of weight units of gold.

The entirety of the rest of the trading community utilises one (homogenised, as it were) fiat currency. We simplify the potential for diversity in the basket of international fiat currencies utilised by assuming that there is one fiat currency and consequently one fiat-to-gold exchange rate in the Fiat Countries. Moreover, Gold Country is a relatively small economy. Hence, its economy has a negligible effect on the fiat nations' economies and particularly on the international gold-to-fiat exchange rate, which can thus be said to be exogenous to Gold Country's economy.

Throughout, we shall denote this gold-to-fiat exchange rate as

$$\epsilon = \frac{\omega}{f} \quad (1)$$



in weight units of gold per fiat currency. *It is imperative to note that this exchange rate is in terms of units of gold per unit of fiat currency, and not vice versa as gold prices are familiarly quoted.* Obviously, it is greater than or equal to zero.

We aver that the Gold Country's denizens do not value the foreign fiat currency in their domestic mercantile transactions – not in the least. The fiat currency's sole value, from the perspective of the Gold Country, is as a means of purchasing goods imported from the fiat nations.

We assume that the Gold Country's exports are paid for in gold by the foreign countries, and that imports are paid for in fiat currencies having been purchased with gold at the exogenous rate  $\epsilon$ . We ignore interest rates.

There is no difficulty in trading betwixt these two segments of the international trading community. Of course, we do not here take into account any political considerations; we analyse only economic ones.

Basing this model on micro-foundations, we model the total gold holdings of the Gold Country by the dynamic wealth equation

$$w_t = w_{t-1} + E_t - I_t \quad (2)$$

where  $w_t$  is wealth, priced in gold at time period  $t$ ,  $w_{t-1}$  is the wealth in the previous period,  $E_t$  is total exports, and  $I_t$  is total imports. Implicit in term  $w_{t-1}$  is an initial gold supply.

The utility function for Gold Country is of a standard decreasing marginal utility format, with separate terms for the utility derived from holdings, exports, and imports:

$$U_t = U_{t,imports} + U_{t,exports} + U_{t,holdings} = \alpha \ln(\epsilon P) + \beta \ln(X) + \gamma \ln(w_t) \quad (3)$$

for  $\alpha, \beta, \gamma > 0$ .

We assume a constant world gold supply with a predetermined proportion in each of the two trading zones. We do not endeavour to investigate the effects of positive nor of negative gold supply shocks. Importantly for the findings of the model, we also do not rigorously take into account changes in Gold Country's total amount of domestic gold and changes over time, preferring to focus instead on short term calculations.

Now we proceed to perform mathematical derivations.

## **B. Mathematical Derivations**

In this section, we proceed to analyse the trading conditions under which the Gold Country experiences a favourable trading relationship. Then, we construct and analyse a utility function which measures the Gold Country's Utility in terms of gold holdings, export goods, and import goods. Next, we analyse the implications of exogenous (fiat nations') price changes on the Gold Country's dynamic wealth, and inquire as to the consequences of exogenous changes in  $\epsilon$ . Lastly, we summarise the results and conclude with a discussion.

Let us begin by delineating mathematically the export and import terms of the wealth equation in (2). Concerning exports: in order to purchase a good in or from the Gold Country, the foreign, Fiat Countries must pay in units of gold; id est, in fiat currency terms,  $\frac{X}{f}$  units of fiat

currency, where  $x$  is the value of the exported good measured in weight of gold. In purchasing this good, the Fiat Countries will lose  $x$  units of gold and the Gold Country will gain said amount. Ergo, summing the  $n$  goods exported by the Gold Country, we may write

$$\sum_{i=1}^n x_i = X \quad (4)$$

which represents total exports by the Gold Country.

Concerning imports: if the Gold Country is to purchase a foreign good priced at  $p$  units of fiat currency, it must pay  $\epsilon * p$  units of gold. Summing the  $m$  imported goods together, we obtain

$$\sum_{j=1}^m \epsilon p_j = \epsilon \sum_{j=1}^m p_j = \epsilon P \quad (5)$$

which represents total imports by the Gold Country.

Substituting the equations in (4) and (5) into (2), the dynamic wealth equation, we obtain

$$w_t = w_{t-1} + X - \epsilon P. \quad (6)$$

Differentiating with respect to  $\epsilon$ , and treating  $w_{t-1}$  as a constant value (since we are past period  $t - 1$  in vantage point) we obtain

$$\frac{\delta w_t}{\delta \epsilon} = -P. \quad (7)$$

Here we may note that *Gold Country's total wealth in gold decreases as the exogenous gold-to-fiat ratio increases*, since  $P > 0$  by assumption. This decrease is sustained through the total imports term  $P$ , which is in nominal fiat units.

In terms of the Gold Country's total gold holdings, then, we see that a low value of  $\epsilon$  is advantageous, and increases cause marginal decreases in gold holdings.

Now, we endeavour to ascertain what level of  $\epsilon$  is the critical value below which Gold Country is at an overall trading advantage and above which it is at a disadvantage in international trade. Call this value the equilibrium exchange rate, or  $\epsilon_{eq}$  in abbreviation. We proceed first by observing that equilibrium wealth in equation (2) occurs when

$$w_t = w_{t-1} \iff E_t = I_t \iff X = \epsilon P. \quad (8)$$

From hence, we may delineate  $\epsilon_{eq}$  as

$$\epsilon_{eq} = \frac{X}{P} \quad (9)$$

where

$$\epsilon < \frac{X}{P} \quad (10)$$

is advantageous for the Gold Country and

$$\epsilon > \frac{X}{P} \quad (11)$$

is disadvantageous, in terms of gold holdings. Concerning the value of  $\epsilon$  in general, note that in the limiting case as  $\epsilon \rightarrow 0$ , the importing advantage for the Gold Country is highest, for it is able to obtain enormous amounts of fiat currency with which it could purchase and import foreign goods. At the opposite end of the spectrum, as  $\epsilon \rightarrow \infty$ , the exogenous, foreign valuation of gold plummets, and the Gold Country would be unable to exchange even large sums of gold for meagre amounts of fiat currency.

The formulae in (9-11) represent clear criteria by which we may judge the Gold Country's advantage in international trade.

### **C. Exports**

To consider exports, we must consider the perspective of the Fiat Nations concerning the Gold Country's prices and subsequent purchase appeal. Let  $\epsilon$  hold at a constant value and let  $\mu$  denote the real domestic purchasing power of Gold Country's currency in units of fiat currency over weight units of gold at a time  $t$  (with fiat prices held fixed); and let  $\zeta$  denote the Fiat Nation's currency's real domestic purchasing power value in the same units. Then the ratio  $\frac{\mu}{\zeta}$  represents the relative strength of the currencies.

Consider a Gold Country good  $i$  that is priced at  $x$  weight units of gold. Assume good  $i$  or its like can be purchased by the Fiat Nations consumer in his (fiat) trading community as well as as an imported good from Gold Country. In order to purchase good  $i$  from Gold Country, the Fiat Nations consumer must convert his fiat currency into gold at the  $\epsilon$  exchange rate, thus obtaining gold, and then pay  $x$  units of gold for the good  $i$ .

Hence, for a Fiat Nations price of good  $i$  denoted by  $\lambda$ , we may formulate the following:

$$\lambda = \frac{x}{\epsilon} \quad (12)$$

So,  $\lambda$  represents the amount of fiat currency necessary for a consumer in the Fiat Nations to purchase good  $i$  from a Gold Country exporter. Then the value  $\lambda\epsilon$  represents the gold weight value of  $i$ .

Clearly, if this price  $\lambda$  is unattractive, or higher than a domestic price of a similar good, id est,  $\lambda_i > p_i$ , then the Fiat Nations' consumer is unlikely to make the purchase. This is equivalent to saying if the Gold Country's price of good  $i$  in gold is greater than  $\lambda\epsilon$ , then the foreign consumer would be dissuaded from purchasing the import from the Gold Country.

We may aver that a Gold Country good available for consumption in both economic regions, id est, as a domestic good in Gold Country or as an export, would carry with it a price that is, at equilibrium, equal to the maximum of the set containing the price that the Fiat Nations consumer is willing to pay for the good  $i$  and the price a domestic consumer is willing to pay for that same good. So, if  $\epsilon$  is too low, the Fiat Nations consumer would likely be dissuaded from

purchasing good  $i$ , since he would have to trade an exorbitant amount of his currency for a good that is not valued so highly domestically.

We generalise as follows: if  $\mu > \zeta$  ( $\mu < \zeta$ ), the prices of Gold Country goods would be unattractive (attractive) to the foreign consumer, just as a modern fiat currency that is valued higher than another would suffer with respect to exports.

#### D. Utility

Concerning the utility function in (3), we substitute  $w_{t-1} - \epsilon P + X$  for  $w_t$  according to the equation in (6), and take the first derivative with respect to  $\epsilon$  to obtain

$$\frac{\delta U_t}{\delta \epsilon} = \frac{\alpha}{\epsilon} - \frac{\gamma P}{w_{t-1} - \epsilon P + X} \quad (13)$$

Setting the equation in (13) equal to zero to find the critical points, we obtain

$$\frac{\delta U_t}{\delta \epsilon} = 0 \implies \frac{\alpha}{\epsilon} = \frac{\gamma P}{w_{t-1} - \epsilon P + X} \quad (14)$$

at the critical point. Taking the second derivative with respect to the same variable, we verify that

$$\frac{\delta^2 U_t}{\delta \epsilon^2} = -\frac{\alpha}{\epsilon^2} - \frac{\gamma P^2}{w_{t-1} - \epsilon P + X} < 0, \forall \epsilon \quad (15)$$

assuming the denominator of the second term above, which equals  $w_t$  is positive, which, in turn, implies a maximum at the critical value for  $\epsilon$ . Solving for this critical value, we obtain

$$\epsilon_{optimal} = \frac{\alpha w_{t-1} + \alpha X}{\alpha P + \gamma P} \quad (16)$$

which represents the gold-to-fiat exchange rate that maximises Gold Country's utility (not necessarily, however, its positive trading advantage, which is determined by the comparison in (10)); and so, we have found that  $\epsilon_{optimal}$  is a function of previous period (gold) wealth, total exports, and exogenous prices, increasing in the first two and decreasing in the latter.

We proceed to discuss the implications of the preceding formulae with respect to exogenous price changes in the Fiat Nations due to inflation and similar phenomena.

### **E. Price Changes in the Fiat Nations**

Given that  $P$  is an exogenous term with respect to Gold Country, and that it is measured in nominal fiat terms, it is informative to adumbrate and ascertain the effects of exogenous price inflation on the equilibrium ratio in (9).

Assuming a constant export level  $X = \bar{X}$ , and variable exogenous price levels in two time periods,  $P_1$  and  $P_2$ , where  $P_2 = \pi P_1$ ,  $\pi$  being the inflation rate measured as  $\pi = 1 + r$ , we may proceed to define the equilibrium levels  $\epsilon_{eq,1}$  and  $\epsilon_{eq,2}$  as



$$\epsilon_{eq,1} = \frac{\bar{X}}{P_1} \text{ and } \epsilon_{eq,2} = \frac{\bar{X}}{P_2} \quad (17)$$

Then, upon substitution for  $P_2$  we obtain

$$\epsilon_{eq,2} = \frac{\bar{X}}{\pi P_1} = \frac{\epsilon_{eq,1}}{\pi} \quad (18)$$

Hence, it is clear that a value of  $\pi > 1$ , id est, nominal inflation, yields  $\epsilon_{eq,2} < \epsilon_{eq,1}$ , implying greater purchasing power for Gold Country in imports.

According to the common wisdom and empirical analysis of many economists the fiat-to-gold exchange rate has gone hand-in-hand with domestic inflation in the modern fiat currency dominated monetary era, in large part due to investor belief that “if the world economy experiences a resurgence in inflation, then gold, like the other traditional inflation hedges, is likely to outperform mainstream financial assets” (Artigas et alii, 75), although the universality of this belief has been convincingly challenged as not applicable to modern investors of all nations by Chua and Woodard (1). Nevertheless, assuming a simply positive relationship betwixt the fiat-to-gold ratio and inflation, then, with respect to the gold-to-fiat ratio, we arrive at a general relationship betwixt  $\epsilon_1$  and  $\epsilon_2$  in

$$\epsilon_2 = \frac{\epsilon_1}{\pi} \quad (19)$$

This implies that the marginal rate of substitution between goods and gold is a measure of the price level when the nominal price of gold is fixed (Chappell and Dowd, 101). Note that, if  $r > 0$ , then

$$\pi = \frac{P_2}{P_1} = \frac{\epsilon_1}{\epsilon_2} = \frac{\epsilon_{eq,1}}{\epsilon_{eq,2}} > 1 \quad (20)$$

Hence, if  $\epsilon_1 < \epsilon_{eq,1}$ , then  $\epsilon_2 < \epsilon_{eq,2}$ , and, if  $\epsilon_1 > \epsilon_{eq,1}$ , then  $\epsilon_2 > \epsilon_{eq,2}$ . Therefore, under the assumption in (19) and positive Fiat Nation inflation, *ceteris paribus*, an initial temporal state of trading advantage (disadvantage) results in the next state being advantageous (disadvantageous).

Since positive nominal price inflation is rather the norm in fiat-currency countries (Barro, 85-90), it is of use to note that its effect in decreasing  $\epsilon$  values is only of advantage to Gold Country. Intuitively, as the prices increase, exogenous gold prices increase, and Gold Country's gold is simply worth that much more in purchasing goods from the Fiat Nations. Hence, Gold Country's utility from imports increases with increasing fiat price inflation. This passive, exogenous advantage for Gold Country of increasing foreign prices seems to be a rather powerful implication of its monetary system that is of particular potency given the commonplace inflationary measures of fiat currency-utilising nations in modern times.

Of course, it is expected that Fiat Nations' domestic finances calibrate in the long-run such that real fiat purchasing power diminishes over time (Borro, 85). Hence, it may be

necessary to qualify that this advantage of Gold Country be delimited to the short-run. Gold Country being assumed to be small, of non-fiat monetary constitution, and economically insignificant in the international trading market, it may be that this concern of eventual purchasing power adjustment from nominal inflation in the Fiat Nations is not of great import in assessing overall advantageousness.

If we assume the historical paradigm of positive inflation in fiat countries (Borro, 85-90) followed by an upward purchasing power adjustment, and assume as well responsive adjustments to the exogenous gold-fiat ratio, then each instant of positive nominal price inflation with lagging purchasing power readjustment represents an advantageous state for Gold Country in its acquisition of foreign goods in the short term.

Clearly, any domestic positive demand shock for gold bullion in the Fiat Nations is advantageous to Gold Country with respect to its import capacity in the short term due to the necessary decrease in  $\epsilon_t$ . Historically, such demand shocks in fiat currency-utilising countries, even during the classical convertible gold standard era of the 19th century, have been caused by economic uncertainty, wars, panics, banks runs, apprehension with respect to quantitative easing regimens by central banks, et cetera (Braga de Macedo, 29, 209-11; Eichengreen et alii, 195-201; Lin et alii, 60). Thus, here we may hypothesise that in the wake of financial uncertainty and economic trouble in the Fiat Nations in which gold is believed to be a hedge against inflation, the Gold Country is at a general trading advantage, given that total exports be at a sufficiently high level.

Concerning impacts of exogenous monetary crises, it may appear that Gold Country would not share the same sorts of economic woes that besiege fiat currency-utilising nations in

times of their monetary turmoil. Also, it is expected that exports to the Fiat Nations under inflation fall should the denizens of the foreign countries purchase less, given the devaluation of their money with respect to gold, but, to reiterate, simultaneously imports should rise given the bolster to the purchasing power of gold. Hence, a decrease in exports and an increase in imports translates into a lower  $\epsilon_{eq}$  value according to the equation in (9).

Concerning the fall in exports, a caveat: we ought to be reminded that we are treating Fiat Countries as having a single fiat currency, as if being a single economic trading unit. In reality, that would not be the case; there would be a number of separate fiat currencies. So, if one country's fiat currency is experiencing inflationary crises, we would expect imports from that particular member of the international trading community to increase, and exports from thence to decrease. In such a scenario, Gold Country has more options; exports to the nation whose currency is experiencing inflationary crises may decline, while exports to other members may remain relatively undamaged. Also, imports from that nation would be in Gold Country's interest, and would therefore increase. Gold Country would have leeway in its choices from whence to import goods, and would not be as severely afflicted with respect to export wealth if exports to a single member (one of many) fell.

So, there seems to exist an inherent advantage for the Gold Country during exogenous, inflationary monetary crises, an observation which attests to a greater stability of its monetary system in comparison to that of the fiat paradigm in general. While gold's domestic economic price stability has often been touted by proponents of a gold standard in general (Bordo, 5-12; Selgin, 12-7), here we may aver that, within the realm of international trade, Gold Country should be at a proper short term advantage in times of exogenous inflationary crises since

$\epsilon_t < \epsilon_{eq}$  due to the rise in foreign domestic prices and the tie betwixt those prices and the gold-to-fiat exchange rate.

### **F. A Note on Potential Export Deficiency**

Under the assumption, which we shall soon apply, of relatively stronger trading currency for the Gold Country, we would expect the export industry to be comparatively weak. Unless the Gold Country can manage to find specialisation in export goods that renders it competitive with the domestic suppliers in Fiat Nations, despite generally higher domestic valuation, it is rather unlikely to experience distinguished export success. Hence, this is where the advantages of its monetary system falter, and where clever governance, trading specialisation, and perhaps even limitations of the outward flow of gold, in the form of imports, may have to be applied in an acute, resourceful manner, in order to compensate. Indeed, smaller countries are in general more dependent on trade in terms of gross domestic product percentage than larger, more diverse, economies (Lewis, 294-5). So, any stifling of export numbers, perhaps, for example, due to foreign import tariffs, if left unanswered, would likely dampen Gold Country's inherent currency advantages with respect to trade.

## CHAPTER 3

### APPLICATION OF THE MODEL TO DETERMINE THE ADVANTAGEOUSNESS OF A STRICT GOLD STANDARD IN TRADING WITH NATIONS UNDER A FIAT REGIME

Now we endeavour, given our model and its findings and implications, to practically determine whether a hypothetical Gold Country would fare well with respect to international trading whilst trading among nations which are under the modern fiat monetary regime. To find an answer, we must (1) accurately (and we shall ponder what “accurately” really means) calibrate the hypothetical gold currency of the Gold Country such that a certain weight of gold is able to purchase a corresponding hypothetical basket of goods; (2) determine the equivalent price in a modern fiat currency such that we may relate the two trading communities’ domestic prices; (3) apply a modern value of the gold-to-fiat exchange rate that is linked to the aforementioned relatable fiat currency; (4) determine using the relations in (9), (10), and (11) under what critical points the Gold Country’s export and import levels ought to be in order for the Gold Country to be at a trading advantage in a modern international trading zone; and (5) to finally judge whether or not Gold Country would be likely to be within the critical values that guarantee international trading advantage. We shall proceed point by point.

#### **A. Calibrating the Gold Currency**

To find an accurate calibration of a modern gold currency in terms of a basket of goods which might allow for relating that currency to a modern fiat currency is a task that can be

approached in more than one manner, the methodology depending on one's viewpoint concerning the intrinsic value of gold. That the Gold Country's government can arbitrarily dictate a value of gold in terms of purchasing power is given, but we assert that the resulting dictate ought to conform with historical precedent, lest there be historically inaccurate calibration of the currency, and thusly a gross under- or overvaluation of gold by weight that does not conform with humanity's natural valuation tendencies for the metal.

The crux of the matter is the capacity to utilise historical, anthropologically-assessed values of baskets of goods measured in past societies' respective gold currencies, whose weights in gold are known, as an indicator of where a modern gold currency calibration would lie - an endeavour which necessitates accurate anthropological economic research with respect to a number of economically-developed societies of the past who utilised a gold currency.

An accurate modern gold currency calibration within a small country such as Gold Country is a multifaceted question whose answer may, in the end, be subjective. Indeed, in the opinion of Cooper, Dornbusch, and Hall concerning an instauration of a gold standard in modern fiat times,

The choice of a price for gold plays a central role in the viability of any restoration of gold to a monetary role. Yet the choice of a price, while crucial, is unavoidably arbitrary and is known to be arbitrary. So long as this is so, a rule based on a supposedly fixed price of gold cannot be a credible rule. If gold were to become unduly constraining, its price could be changed, and that would be widely known-indeed, it is intrinsic to the process of setting a price in the first place. In this respect, the situation today is fundamentally different from the situation in the nineteenth and

early twentieth centuries. Then the dollar price of gold was historically given and not open to question (except for minor adjustments on several occasions to preserve the relation to silver). The price was not conceived as a policy variable. Now it is, indeed must be. Yet gold ceases to provide monetary discipline if its price can be varied. So long as the price of gold is a policy variable, a gold standard cannot be a credible disciplinarian. It provides no escape from the need for human management, however frail that may seem to be. (36)

This viewpoint in particular, though, addresses setting a fiat price of gold - indeed a seemingly arbitrary issue, but one that is framed differently in Gold Country, whose gold standard is strict in its absence of fiat currency, and whose calibration relies on gold supply, and natural valuations of the metal (Rasho, 26).

Nevertheless, we hold fast to the usage of historical precedent in one form or another so as not to distort the hypothetical calibration with grossly unlikely good valuations in units of gold weight. Now, we shall make use of Zarra Nezhad's findings (mentioned above in detail in the Background section) as to the purchasing power of the historical gold dinar rather conclusively for the sake of the model's application.

## **B. A Price for the Gold Country Currency in Fiat Terms**

Due to the relative historical stability of the gold dinar, and the availability of data and academic research concerning its value and usage, we choose to model Gold Country's currency on said coin. Here we apply Zarra Nezhad's findings concerning the historical dinar in order to delineate a relatable, modern price of the hypothetical gold currency in fiat terms. That price,



according to Zarra-Nezhad is 32.5-36.5 United States dollars, circa 2004, per dinar. The weight in gold of the historical dinar is estimated in Zarra-Nezhad's research to be approximately 4.25 grammes of gold (1).

By making exclusive use of this particular economic-anthropological finding, we run the risk of ignoring other pertinent data from different time periods and civilisations which may ultimately deliver varying results. Nevertheless, the dearth of reliable anthropological research concerning other historical gold purchasing power values, and the adulteration the classical and modern European and American metallic currencies with the advent of bank note representations of money in Europe, money multiplication by fractional reserve lending, the advent of central banking and monetary policy, and finally fully fiat currencies make Nezhad's estimation rather convenient for our purposes, as it conforms more with the model's basic assumptions about the strict and plain nature of the Gold Country's domestic currency. However, to recapitulate, the reputed economic stability of the era and the expansive geographic region in which this specie was utilised widely makes it an attractive choice.

Therefore, we adopt the average of the above price range values, 34.5 United States dollars, as the hypothetical relation between the Gold Country's currency and the Fiat Nations' currency in terms of a basket of goods. Per gramme of gold, we obtain the ratio:

$$\frac{34.5 \text{ \$}}{4.25 \text{ g}} \approx 8.12$$

dollars per gramme of Gold Country's currency, or 230.20 dollars per ounce. From hence, we proceed to compare this price to the modern price of gold in dollars per gramme according to a modern metallic bullion exchange rate. Some considerations regarding the sizeable, upwardly-trending long-term fluctuations of this price in recent times due to an amalgam of political, financial, monetary, and social events and phenomena ought to be reckoned in our deliberations as to what price level to apply as an appropriate value for the exogenous  $\epsilon$  exchange rate in our application of the model to a modern scenario. However, the general upward trend of gold-to-dollar makes high value choices seem safe to use (Macrotrends).

### **C. Comparing the Gold Country Currency's Fiat-to-Gold Weight Ratio in View of Modern Gold Bullion Exchange Prices**

Given the great fluctuation, with a general upward trend, in nominal gold bullion prices since the end of the Bretton-Woods Agreement in 1971 driven primarily in the long term by the printing (and later to include digital augmentation) of fiat currencies worldwide (Worthington et alii, 261), we see that there is an obvious upward trend that diminishes the real purchasing power of the United States dollar, to take an example, in terms of that natural gold value which one may hypothesise to exist.

For the sake of a modern application of the model, we pick a value of gold circa 2004, so that it is in line with Zarra Nezhad's dinar valuation. Let us settle on 1300 United States Federal Reserve Notes per ounce of gold for the sake of practical application, a number that is near to the 2018 average value of 1268.93 dollars per ounce, according to the Macrotrends data website.

The inverse of this number yields the exogenous exchange rate at which the Gold Country must trade internationally, id est,

$$\epsilon_{1300} = \frac{1}{1300} \approx .000769$$

ounces of gold per dollar.

Then, applying the inequality in (10), we may aver that in our hypothetical modern application the ratio of exports to the sum of imported good prices in fiat terms for the Gold Country must be greater than .000769 in order to arrive at  $w_t > w_{t-1}$ , id est, in order for Gold Country to gain in gold wealth over time. This may seem a paltry task; its success is dependent on the volume of imports and exports and the exogenous nominal prices of the purchased imported goods.

#### **D. A Numerical Example**

Exempli gratia: If the Gold Country were to import, say, one million dollars worth of goods from the Fiat Nations, implying  $P = 10^6$ , then, according to the inequality in (10), total exports  $X$  must be greater than  $10^6 * .00076923 = 769.23$  ounces of gold worth of goods for a trading advantage to exist. Applying our value of 230.20 dollars per ounce of Gold Country's currency in Gold Country's domestic purchasing power value terms, we arrive at  $230.20 * 769.23 = 177076.75$  dollars worth of exports (from the Gold Country's vantage point).

Hence, the requisite ratio of exported to imported goods is  $\frac{177076.75}{10^6} = .1771$ . This ratio is

precisely the equilibrium  $\epsilon_{eq}$  found in the quality in (9). We may also calculate in gross terms the minimum required net exports of Gold Country as  $-10^6 + 177076.75 = -822923.25$ .

Note that if there were no discrepancy between the respective domestic valuations of gold of the two communities, then the requisite export requirement for international trading advantage would simply be positive net exports; id est, an export to import ratio greater than one. Yet, due to the existing discrepancy in domestic gold valuation, we have a tremendous downsizing of the requisite export level for being in an advantageous state; and the lower the  $\epsilon$  value, the greater this downsizing becomes. The extent of advantage, to recapitulate, is determined completely exogenously to the Gold Country, as the domestic bullion prices in Fiat Countries is the determinant, and Gold Country, being economically small, is effectively incapable of its influence.

From the above example, we may note that Gold Country has great leeway in import amount due to currency strength, and may be safely comparatively more dependent on imports whilst remaining at a trading advantage, given a constant export level. Hence, it may be comfortable in importing relatively higher amounts as a proportion of its total consumption than nations which contend on a fiat monetary playing field.

It would seem indeed a paltry task for a nation, including a small one, to maintain a low ratio like that found in our example, or higher, of exports to imports. This is especially the case if the country may wilfully impose limitations on import quantities with asymmetric repercussion in export sales. Yet, we find that many small economies competing in international trade today have export-to-import ratios of less than one, and are thus at a disadvantage in trade. They would, of course, need to maintain strictly positive net exports for to be deemed to have a

quantitative advantage given their fiat monetary systems. Indeed, smaller countries (in terms of population and subsequent economic size) are more dependent on foreign trade in general as a proportion of their economy (Lewis, 294-5). As a side note, if one were to compare Gold Country to a particular modern, small nation, one must needs choose wisely so as to avoid contamination due to real-world political and cultural biases that may arise and may thus not serve as an appropriate comparison in a purely economic analysis.

### **E. Verdict of Favourability**

From the previous findings, we aver that it is as if the Gold Country, merely by virtue of its monetary system, exploits the general nominal inflationary weaknesses of its trading partners, namely, the historically downward trend of the exogenously-determined gold-to-fiat exchange rate,  $\epsilon$ . The key in the diminution of the requisite export to import ratio lies squarely in the differing valuations of goods in terms of gold betwixt the two trading communities. The inflation of gold prices in the Fiat Nations is clearly to the advantage of Gold Country in trade if Gold Country is able to trade its gold for fiat currency at that rate. Thus, we aver, given the clear historical upward trend of nominal gold prices in the modern (fiat-dominated) era (Barro, 85-90), and the discrepancies of modern gold valuation with historical, perhaps apt to be called (more) ‘natural’ gold valuations, that a country utilising a strict gold standard in a modern setting, abiding by the assumptions of this model, and holding a sufficient export level, *ceteris paribus*, would be highly likely to have a stronger currency and thus be at an advantage in imports. Furthermore, in the short term, with positive nominal inflation in nations which utilise fiat currencies, the Gold Country would be able to take advantage as real prices take time to adjust in

the Fiat Nations. However, the capacity to export goods is theoretically harmed by the strength of the currency, and an export amount must be above the necessary equilibrium value such that the inequality in (10) is satisfied.

## CHAPTER 4

### SUGGESTIONS FOR FURTHER, RELATED RESEARCH

Pertinent to Gold Country's long-term success in international trade is its capacity to export goods such that the inequality in (10) is maintained whilst maintaining a relatively stronger currency. Hence, the application of methods for nations with stronger currencies in maintaining export strength, such as specialisation in export goods, ought to be applied to more completely address Gold Country's propensity to be at a long-term advantage. These theoretical trading methods are general and may be applied to nations of whatever monetary standard. For example, we may want to ascertain whether it is an imperative that Gold Country, though small, produce or contain some collection of products or natural resources that are in dearth in Fiat Nations and in which it may specialise in exporting in order to maintain sufficient export levels and thence long-term wealth increases.

Exports are really the key to success for Gold Country, for though the level of exports it must maintain is comparatively low in terms of total international trade, it must nevertheless suffer being a small economy with a strong currency, whose goods may be prohibitively expensive for foreigners to consume.

Also, the trading community's (or world's) physical gold supply ought to be taken into consideration in expanding this model. Indeed, the supply of gold in Gold Country, initial and dynamic, would play a great role in domestic price valuation, and increases in gold holdings would likely cheapen domestic prices, which in turn would make exports more attractive. It is

rather improbable that a source of gold be found within the territory of Gold Country if its territory is small (though, by the assumptions of this model, we make no comment as to its territorial breadth, only its relative economic size). Questions arise as to how exogenous positive supply shocks would affect the trading scenario. One would expect an increase in  $\epsilon$  that would be adverse to Gold Country's minimum necessary position.

Additionally, concerning gold supply, a mathematical investigation as to the actual proportion of world gold supply Gold Country would have given an initial trading scenario that satisfied (10) would be highly instructive. That is, if Gold Country's wealth would increase, gold would pour into its coffers whilst gold supply in Fiat Nations would decrease in toto. The extent of decrease may be considered to have an effect on exogenous  $\epsilon$  if the size of Gold Country's economy is sufficiently large, which will prove problematic for the Fiat Nations as  $\epsilon$  decreases, compounding the effect of nominal inflation over time. One might even expect some sort of exponential relationship in this regard in which Gold Country's share of world gold supply increases tremendously with over time, given a requisite export term value in each time period. Similarly, given a state that does not satisfy (10), perhaps Gold Country's coffers would run out rather quickly? It would be interesting to investigate such scenarios.

Clearly, the model addresses competition betwixt one group that uses fiat currency and another on a strict gold standard - however, what if fiat economies were to revert to the 19th century norm of fiat money backed by gold at a certain fixed exchanged rate or floating on a 'world price of gold'? It would be interesting to see how a strict gold standard-utilising economy which does not feature fiat paper currency backed by gold reserves, and hence does not exhibit the concomitant money multiplier effects, would compete against such economies, which



historically arose in the era in which central banking became more widespread and which preceded the modern purely fiat regime. Perhaps many similarities to this model's conclusions may be drawn.

Furthermore, in the precious metals market today, there exist investment options wherein one may purchase gold indirectly in the form of a certificate from a bank, with no guarantee that that certificate represents a real physical quantity of gold held by the bank, much in the same way that a bank in the classical gold standard era of the nineteenth century and prior may not have kept a one-to-one ratio of reserves and deposit amounts. Hence, questions arise as to the actual physical amount of the metal in circulation; that is, the nominal supply of gold itself may be inflated, and hence gold's price in fiat terms may in fact be depressed, as many financial advisors assert (Maloney, 31-3). Furthermore, investment shares in gold mines, minting companies, speculation firms, et cetera, may represent a sort of investment in gold that is not a physical acquirement thereof and which may have a deflationary influence on the exogenous  $e$  value by making supply artificially high. Such inquiry may be of interest.

## CHAPTER 5

### CONCLUSION

Given our simplifying assumptions, a small country on a strict gold standard, in which all goods are purchased in units of gold weight, would likely have a stronger currency in comparison to fiat currency-utilising trading partners, and would thus be at a distinct advantage in being able to import goods relatively cheaply. Indeed, the extent of this advantage is determined exogenously by those nations' gold-to-fiat exchange rate, which fluctuates daily but which has historically, due to nominal price inflation of various causes, tended upwards during this modern fiat regime era.

Given the relative strength of the gold currency, the viability of overall trading success is contingent upon maintaining a relatively low export threshold that would allow the ratio of exported goods to the sum of imported goods' prices to be greater than this exogenous gold-to-fiat exchange value. As long as this threshold is maintained, overall gold wealth should increase dynamically.

The simplifying nature of the assumptions ought to be elaborated for future research into this topic, so as to evaluate the actual export capacity of a small country on a gold standard, and, furthermore, to investigate modern gold trading mechanisms, practical impediments to trade, and dynamic gold supply shares in the two trading communities.

The history of the usage of gold (and silver) as currencies in their own right is a much longer history than that of the fiat regime; and so, reversion of a small part or larger of the

international trading community to a gold-based system may well be a historically mature prognostication that ought to be taken into greater consideration in big-picture economic research.

## CHAPTER 6

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