



## **Triffin's dilemma and the instability of the International Monetary System**

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### Abstract

This work is an attempt to quantify the determinants of global liquidity and its relation to the price of gold. The first part includes a theoretical overview of the economic approach. The second presents an econometric model. The period covered in the analysis is from the breakdown of the Bretton Woods system (BW) in 1971 until the recent crisis of the international monetary system. Recently the price of a troy ounce of gold has exceeded \$ 1,000, but 40 years ago its price was \$ 35. The theoretical assumptions examined include, among others, the 'Triffin dilemma', as set out by Robert Triffin, a Belgian economist who's work alerted economists to the vulnerability of the system agreed in Bretton Woods.

Keywords: Liquidity, Dollar and Gold price, Bretton Woods, Cointegration

### 1. Introduction

#### The recent crisis

On the morning of Monday September 15 2008, I watched in amazement as the fall of the oldest U.S. investment bank, Lehman Brothers, was reported on the Bloomberg channel. It was like watching the fall of the twin towers on September 11, but this time the financial system collapsed from within, caused by the same actors and protagonists of the monetary system. Ironies of history. The crisis had been dubbed the "subprime crisis" and I was reminded of a course I had taken in 2000 at the London School of Economics, on derivatives products, which covered Hull's book on the theory of efficient markets, and the value of options, including the volatility embedded in the Black & Scholes model.

'The world is a Casino' as Susan Strange has said<sup>1</sup>. An example is readily available: in 1995 a young trader Nick Leeson succeeded in destroying the 232 year old. British merchant bank Barings Brothers. The details and testimony are recounted by the author<sup>2</sup>.

Leeson, working in the Singapore branch, used derivatives to bet on the future recovery of the Nikkei225 Index, but the Kobe earthquake struck like a black swan<sup>3</sup>. The index fell sharply and the rubble was exposed: the account 88888 was empty and the brilliant young trader was arrested before news of the collapse of the bank reached the Queen, as described by "Time" magazine of 13 March 1995.

A year before the reign of Barings ended, in 1994 a hedge fund was founded, Long Term Capital Management (LTCM), that was itself to rock the financial system. The board of directors included Myron Scholes and Robert Merton, who in 1997 were awarded the Nobel Prize in Economics for their contribution to the valuation of derivatives. This hedge fund was tremendously successful with annualized returns that topped 40%. The secret to those returns however was the tremendous leverage employed of 25 times per dollar invested. When the "Black Swan" of the Russian default in August 1998 occurred, this leverage hit the fund hard, and it was as clear that the fund was spent as Barings had been when Lesson's positions became known. But this time LTCM was considered too

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<sup>1</sup> "Casino Capitalism" Susan Strange Manchester University Press 1986

<sup>2</sup> "88888 The secret account" The fall of Barings Bank told by the man who brought it" Editorial Sudamericana 1996

<sup>3</sup> Is an allusion to the book by Nassim Taleb;"The Black Swan". Penguin Books 2008



big to fail and the U.S. Federal Reserve came to the rescue. According to a 2000 paper, the core of the problem had been the underestimation of risk in terms of VAR <sup>4</sup>

As the days passed following the Lehmans' collapse, I recognised in the emerging details something was already known: the Value At Risk (VAR) models which gave almost zero probability of risk to "subprime" collateralised debt obligations, showed that the first victims of these unintelligible structured products were the same banks that produced them. The contagion was immediate and distrusted banks to each others, the credit collapse and the Libor rate soars. Everyone agreed that the business model of large investment banks ended. But what was this business model? <sup>5</sup>

In a short essay, I argued that traditional banks have lost their original function, which was historically to take deposits and make loans. The traditional commercial banks have been transformed into investment banks and more precisely into "gambling banks" (<sup>6</sup>). That has happened because traditional marketed products have become commodities. As those products became standardized they also became abundantly cheaper. Investment banks and hedge funds have been the main promoters of derivatives, whose growing sophistication and differentiation has led to exponential growth in volume. According to statistics from the Bank for International Settlements (BIS), in December 2002 the total notional outstanding was US\$141 trillions; by December 2008 that figure was US\$591 Trillions, 10 times the estimated value of world Gross Domestic Product

I was reminded of the Tequila crisis in Mexico 1995, the devaluation in Thailand in 1997, Russia in 1998, Brazil in 1999 and the collapse of convertibility in Argentina in 2001. These were all in the peripheral countries, but the current crisis was the first of this magnitude to happen in the industrialised countries since the Great Depression. The program of study at the LSE included these peripheral crises as systemic risks of a global system. However, it is no longer possible for countries to decouple from a crisis because the global system today is a totality and functions as such.

I started to review my books and notes from the courses at the LSE and it seemed appropriate to present the issue from the perspective of the historical-political approach(<sup>7</sup>) to the economy and the world power system, as was presented by Professor Nilesh Dattani in his course in 1998: "The Global Finance."

## 2. Section 2

### Background

Triffin's dilemma is rarely mentioned in economic literature, but it is in economic history: "A further problem was the Triffin dilemma. Robert Triffin monetary economist, Yale profesor , and architec of the EPU, had observed as early as 1947, that the tendency for the Breton Woods System to meet excess demands for reserves through the growth of foreign dollar balances made it dynamically unstable" <sup>8</sup>

His main argument contended that the Bretton Woods System, by having the dollar as a global reference adjustable to \$ 35 an ounce, would entail the U.S. having a permanent deficit in order to provide the dollars needed for the functioning of global trade. The dilemma posed by the fixed parity system was that it would take some time to issue more U.S. dollars than allowed by the pattern of dollar-gold convertibility. The alternative was to return to the deflation of the 1930s. It was not long

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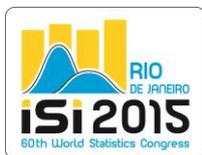
<sup>4</sup> "Risk Management Lessons from LTCM" by Philippe Jorion Award EFM Journal 2000

<sup>5</sup> "Traditional Banks have no future"? A brief essays by Roberto Kalauz.LSE. Summer course 2001

<sup>6</sup> "Mad Money", Susan Strange. Manchester University Press

<sup>7</sup> "The Politics of Global Finance" IR 202 Summer Course LSE 1998. Objective: To impress upon students the importance of analyzing the international monetary and financial system in terms of Politics and Economics operating at domestic and international levels. *Adjustment, liquidity and confidence.*

<sup>8</sup> "Globalizing Capital , The History of the International Monetary System" Barry Eichengreen Princeton University Press 1996.Pag 116



before the dilemma was proved true: the emission of dollars was led by domestic political considerations in the US, including the Vietnam War, rather than the dictates of the Bretton Woods arrangement. By holding the right to issue the global reserve currency, the Bretton Woods system granted the US an "exorbitant privilege", the right to "seignoraje" in the words of General Charles De Galle.

In 1944, U.S. gold reserves were 21 582 tons; in 1960 they were 15 821 tons, and by 1971 they were just 8500 tons. On August 15, 1971 President Nixon unilaterally suspended the convertibility of the US dollar into gold, a move that the then Director of the International Monetary Fund (IMF) only learnt about on the television news

The breakdown of the Bretton Woods system brought with it important consequences. The first of the oil price shocks occurred in 1973 and 1975, affecting the rest of the commodities. Simultaneously, with global currency parities dismantled, the world entered a period of tremendous volatility.

The present work does not aim to study the history of the international financial system, but will instead point out landmarks of extreme fragility, including a brief overview of the Gold Standard. The current world financial catastrophe has revived the Triffin dilemma both in its original scheme and in the meaning of the large central bank reserves of developing countries<sup>9</sup>.

This paper also considers the existence of liquidity in the shadows, the "Over the Counter" (OTC) derivatives contracts of unregulated financial products and highly leveraged counterparties, which further compounds the instability of the system and gives new dimensions to the Triffin dilemma.

### 3. Section 3

#### An attempt to model the Triffin dilemma

The multiple determinants of global liquidity after the breakdown of Bretton Woods in 1971 require a complex system of equations that are beyond the purpose of this work. However we present a simple model and unicecuacional of significant variables and statistical tests raffled.

While the starting point of theoretical analysis was the gold standard, the quantitative analysis covers the period after the break in 1971 until the financial crisis of late 2008. The s relevant variables were analyzed with the methodology of the general to the particular were U.S. monetary aggregates and macroeconomic variables. The price of gold and other commodities were taken from the Reuters database. The frequencies were taken monthly, quarterly and annually.

The study of the series and its relationship aimed at finding a long-term structural relationship that was hinted at some graphics, to relate the evolution of the price of gold and the monetary aggregate M1 Following the previous methodology was used a classical linear model, uniecuacional and static to study the long-term relationship



Then for the short-term approach, using the Engle-Granger approach the equilibrium correction model. The selected variables were tested with the Dickey Fuller test. We wanted to check whether a sequence  $Y_t$  follows a random walk or a process AR (1). The null hypothesis is that Dickey-Fuller  $Y_t$  follows a random walk, ie :

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<sup>9</sup> "Reserves currencies and solving the new Triffin's dilemma" by Ousmene Mandeng, Central Banking Publications LTD

$$H_0: Y_t = Y_{t-1} + \epsilon_t$$

the alternative hypothesis which states that  $Y_t$  follows an AR (1)

$$H_1: Y_t = \alpha Y_{t-1} + \epsilon_t \text{ where } |\alpha| < 1$$

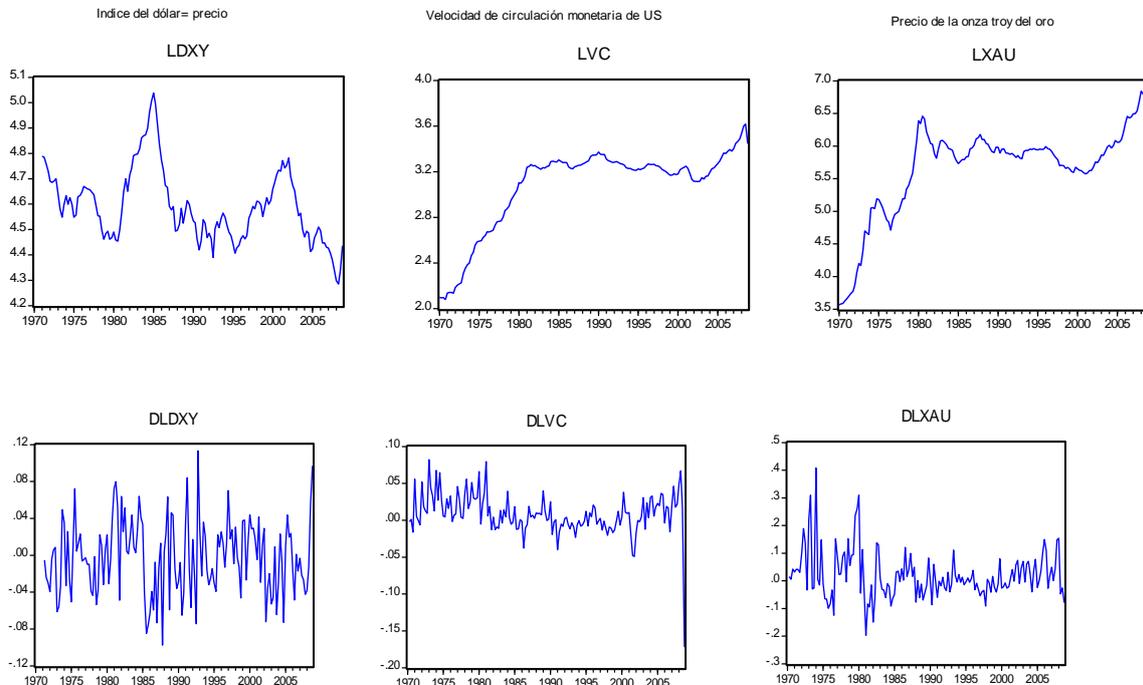
An easy way to check if  $Y_t$  follows an AR (1) is by subtracting  $Y_{t-1}$  from each side of the equation. This can then be rewritten in the following equation;

$$\Delta Y_t = \gamma Y_{t-1} + \epsilon_t$$

Where  $\gamma = \alpha - 1$ . Testing  $\gamma = 0$  is equivalent to testing a random walk

$$\Delta Y_t = \alpha Y_{t-1} + \epsilon_t$$

$$\Delta Y_t = \alpha Y_{t-1} + \epsilon_t$$



We note that are not stationary. We tested the non-stationarity through the Dickey-Fuller test, so we differentiate the series to be stationary to see if they are cointegrated in the order D (I) and to raise the static model to reach uniecuacional correction component errors and then test results with the VAR model (vector autoregressive) and VEC (vector error correction).

The principle behind these models is that there is a long-term balance between economic variables and yet, in the short term there may be imbalances. With error correction models, a proportion of the disequilibrium from one period (the error, interpreted as a departure from the path of long-run equilibrium) is corrected gradually through partial adjustments in the short term:

$$\Delta Y_t = \alpha(Y_t - Y_{t-1}) + \epsilon_t$$



The VEC can be estimated as proposed by Engle and Granger two-stage, performing first uniecuacional regression of long-term static and then using this residuals in the dynamic equation

A group of time series is cointegrated if there exists a stationary linear combination and that combination has a stochastic trend. The linear combination is called "cointegration equation", which is interpreted as the relations of long-term balance between the cointegrated variables of the same order, therefore we can not discuss cointegration in the context of stationary time series. The order of integration is defined by the number of times I have to differentiate the series to make it stationary

We can consider prudent the proposed two-stage Engle and Granger, also a way of using classical econometrics and see if the coefficients and statistical tests also coincides with conceptual results expected from economic theory.

Since the static method does not require stationarity of the variables to introduce, we were applied logarithms only to the original in order to smooth the series. The model thus meets the requirements set classic validity of its parameters, all being significant and with the presence of high autocorrelation of the residues, as detected by the Durbin Watson test. In order to correct significant jumps in the setting of residuals added three dummy variables, one in 1974 and two in 1980.

Dependent Variable: LXAU

Method: Least Squares

Date: 03/28/10 Time: 04:48

Sample (adjusted): 1971Q1 2008Q4

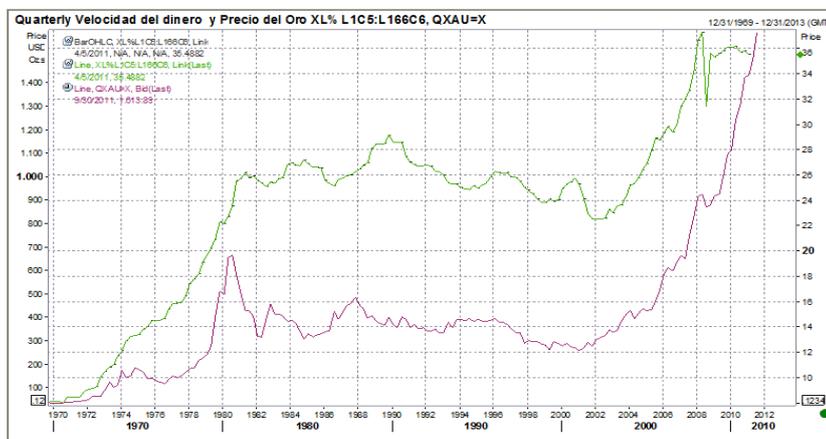
Included observations: 152 after adjustments

Variable	Coefficien t	Std. Error	t-Statistic	Prob.
D1974Q1	0.447247	0.181577	2.463131	0.0149
D1980Q1	0.616510	0.179699	3.430792	0.0008
D1980Q3	0.632608	0.179956	3.515347	0.0006
LVC	1.677745	0.045518	36.85885	0.0000
LDXY	-0.671847	0.105779	-6.351434	0.0000
C	3.578583	0.539629	6.631559	0.0000
R-squared	0.919533	Mean dependent var		5.705906
Adjusted R-squared	0.916777	S.D. dependent var		0.619672
S.E. of regression	0.178765	Akaike info criterion		-0.566813
Sum squared resid	4.665723	Schwarz criterion		-0.447450
Log likelihood	49.07781	F-statistic		333.6809
Durbin-Watson stat	0.445007	Prob(F-statistic)		0.000000

#### 4. Section 4

An era fueled by unusually low rates and high activity of private credit and leverage in financial derivatives. The latter deserve further study in depth. In the diagram the step is variable M1( U.S.), although the model was generated for the variable velocity of money, which accompanies both the inflationary and the deflationary phase

## Velocity of money and the price of gold



### 5. Conclusions

We conclude that the variables used show significant overall test and the signs are as expected, negative in the index of the dollar and positive for VC. Interestingly, the parameter  $C = (3.578583)$  of the static regression, the value of 35.8 is the value of gold during the life of Bretton Woods agreement. The recursive stability test of the constant and its variance tends to a long-term equilibrium, as can be seen in the above graphs.

U.S. consumption fueled by liquidity is expressed asymmetrically in the deficit as a counterpart surpluses generated in other countries, dollars that somehow return to the System. What is new is that the model fits both the short and the long term, it is conceptually significant regression coefficients of long-term and the value of 1, 6 for variable speed monetary and -0.6 for the dollar index. It is important conceptually in operating profit as being in logarithms are the elasticities.

### References

#### Bibliography on econometric models

- J. Johnston "Econometrics Methods" Third Edition 1984
- Carl E. Walsh "Monetary Theory and Policy", The MIT Press 1998
- Stephen M. Miller ; "Monetary dynamics : an applications of Cointegration and Error-Correction Modeling. Journal of Money, credit and Banking Vol 23 No 2, (May 1991)
- Hafer R.F., Dennis W. Jansen ; "The demand for monetary in the US. Evidence from cointegration Tests. Journal of Money, credit and Banking Vol 23 No 2, (May 1991) pp 155-168
- Pierre Perron; "The great crash, the oil price shock, and the unit root hypothesis" "Econometrica" vol 57, No 6 (November 1989) 1361-1401
- Peter Temin, "Lessons from the great Depression". MIT Press 1991
- Ahuamada Hildegart A and Garegnani, Maria Lorena. "Understanding Money demand of Argentina 1935-2000. Jornadas de Economía Monetaria .La Plata 9 y 10 de mayo de 2002
- Co. Integration and error correction: Representation, estimation and Testing
- Robert F. Engle and C.W.J. Granger. Econometrica. Vol 55 No 2 (May 1987) pp 151-276
- Speculativs Bubbles, Speculativs Attacks and Policy Switching. Robert P. Flood and Peter Garber, Chapter 10 "Gold Monetization and Gold Discipline page 193. MIT Press
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