ARE BHAGWATI'S ARGUMENTS AGAINST FREE TRADE RESTRICTED TO CAPITAL FLOWS ?

Mourad Ayouz, Sylvain Chabe-Ferret, Françoise Gerard and Tancrède Voituriez[1]

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JEL classification : Q14, Q17, Q18, G14, G15

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[1] Centre for International Research on Agriculture and Development (CIRAD) France. Contact person : Tancrède Voituriez, 45 bis Av. Belle Gabrielle, 94736 Nogent sur Marne Cedex, France. Tel. 33 1 43 94 72 43. tancrede.voituriez@cirad.fr

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" Trade in goods and services is a different animal from capital flows. It is not subject to herd behaviour, panics, crashes, destabilizing speculation, which we all studied going back to Aliber and Tiffen, self-justifying outlflows of capital currency speculation and so on " (Bhagwati, 1998b)

1. Introduction

The question we raise is whether Bhagwati's (1998a) arguments for risk-reducing, short-term public intervention are restricted to capital flows. We focus particularly on their possible implication on the debate over free agricultural trade. Market instability upon which Bhagwati's arguments against free trade in capital are made can be considered indeed as a specificity of commodity markets as well. High volatility in prices seems mostly shared with financial and capital markets, making them different from manufactures, where price risk proves much lower[2] and it is on this common feature that risk management instruments have been developed and transferred from one market to the other over past centuries. The forward contracts, dated back to Tulip bulbs in Holland in the early XVIIth, the futures contracts on grain in the mid XIXth in US, were passed to the financial and capital market in the XXth century (Williams, 1982). Conversely, innovation in insurance and derivatives with second generation option models passed back to agriculture during the last two decades. Last, unpredictable cycles, bubbles and burst, seem to equally characterise financial and capital as well as agricultural markets. In Holland during the early 1600's it was not stocks, but tulip bulbs that made investors rich beyond their dreams, ruined thousands when the Tulip Bubble burst, and threw the national economy into major depression.

[2] See World Bank (1994) for the comparison of primary commodity and manufactures price indexes instability over the XXth century, where the former is twice higher than the latter on average over decades. The Boughton (1991) index series completed until 1999 indicates an instability premium of 30% of commodities on manufactures over the whole XXth century.

Apparent affinities between financial and capital markets instability, and agricultural markets, give a particular echo to Bhagwati's advocating against free trade and for short term, public interventions on capital market, for it being intrinsically unstable and prone to crisis. While they obviously cannot be duplicated as such on any other market, his arguments for short term intervention provide a stimulating and renewed insight on trade and risk management policies on unstable agricultural markets, as well as on appropriate discipline within WTO.

To answer our question we first assume equivalence relationships between operators behaviour and price properties on a given market. Then we compare the dynamic properties of agricultural and financial as well as capital markets on an original set of data. Focusing on 22 prices series and 9 price behavioural indicators, we find that agricultural markets exhibit similar patterns and behaviours as financial and capital markets. With due limitations of instability consequences of the two markets on national economies, we derive consequences of our result on WTO discipline and its ability to improve global welfare while reducing social cost induced by risk.

We recall the risk pooling function of free international trade in section 2. Risk-based arguments against free trade in capital are reviewed in section 3. Equivalence relationships between operators behaviour and price properties are set in section 4, along with indicators of market behaviour and data presentation. In section 5 results are presented and discussed. Some implications on policy definition and WTO disciplines conclude the paper.

2. International trade as an insurer

The failure of international commodity agreements as well as the social cost of domestic price stabilisation policies when dealing with persistent shocks and non stationary prices make agricultural prices instability issues progressively entrusted to market-based instruments, preferably to trade and support distortive measures (World Bank, 1999 ; Unctad 2002). A salient issue for population and policy makers, especially in commodity-dependent countries, is to make available appropriate means of risk coping to agricultural operators, so as to avert social losses of upsurges and downswings in their economy, without compromising trade partners expected grains from trade.

One possible means of reducing price risk is trade. Assuming volatility in agricultural prices to be due to the lack of price responsiveness in demand, coupled with the fact that short run supplies are volatile and largely pre-determined, some authors have documented the positive relationship between freer trade and lower market instability. In a seminal contribution, Bale and Lutz (1979) demonstrated how international trade should reduce price risk. By spreading supplies across geographically dispersed markets, it pools the (supposedly uncorrelated) risks faced by a large number of individual across the world. International trade acts then as an insurer, essentially eliminating aggregate risk by virtue of the large numbers law. With similar assumptions, Tyers and Anderson (1992) and Vanzetti (1998) provided evidence of the risk-reducing potential for agricultural trade, when substituting for commodity storage in world food markets. Because increasing the spread in geographical supply reduces the spread in prices, removing insulating policies results in a drop in world prices variability according to their findings. It would moreover make price distribution closer to the normal law, enabling the provision of private insurance mechanisms at the lowest cost for remaining price risks (Black and Scholes, 1973, Black 1976, for the definition of riskless option premium). Price risk is pooled by international trade at a single point in time. Remaining risk is diversified across time using financial instruments like derivatives. Futures, options, swaps, for the most simple ones, are the second, market-based means of risk coping.

Since the aftermath of the financial crisis in the late 1990s in South-East Asia, advocators of free trade in agriculture, and more broadly in every good and service have been urging the IMF not to liberalise capital flows (eg. not to ensure capital-account convertibility). They implicitly argued that risk on such a market cannot be efficiently pooled by international free capital flows at a single point in time. Remaining risk cannot be completely diversified either across time using derivatives. Capital

market instability - and capital market instability only – disrupts the linkage between pooling on geographical flows and diversification over time, and hence makes a case against free trade.

3. The arguments against free trade in capital

The IMF Interim Committee at its annual meeting in Hong Kong in 1997 issued a statement endorsing an eventual move to capital account convertibility, "which means that you and I, nationals or foreigners could take capital in and out freely, in any volume and at any time" (Bhagwati, 1998a : 7). The obligations originally listed in 1944 in the Articles of Agreement, on the other hand, included only avoidance of restrictions on payments for current transactions and did not embrace capital account convertibility as an obligation or even a goal.

The seductive idea according to which if freeing up trade improves markets efficiency then capital also should move freely across borders faced a wide protest among civil society[3] as well as among renowned economists beside Bhagwati like Krugman (1999), Rodrik (1998) and Stiglitz (1998). The responsibility of capital mobility in Asian crisis in the late 1990s and its detrimental consequences on today livelihood in affected countries has been documented and opposed to IMF strategy ever since (Stiglitz, 2000, 2002). Stiglitz (2000) suggested that the increased frequency of financial and economic crises was related to financial and capital market liberalisation. Cross-country studies have confirmed this (Demirgüc-Kunt and Detragiache, 1998). Cross-country econometric studies looking more broadly at the impact of capital market liberalization on the likelihood of an economy having a recession have again confirmed the adverse effects (Easterly et al., 1999). "Thus, it is clear that not only is there no compelling empirical case for capital market liberalization, there is a compelling case against capital market liberalization, at least until countries have found ways of managing the adverse consequences" (Stiglitz, 2000 : 1079).

Arguments against free capital flows rest upon the behaviour of market operators : " Trade in goods and services is a different animal from capital flows. It is not subject to herd behaviour, panics, crashes, destabilizing speculation, which we all studied going back to Aliber and Tiffen, self-justifying outlflows of capital currency speculation and so on " (Bhagwati, 1998b). They are explicitly restricted to capital market. "markets for information are fundamentally different from ordinary markets. For instance, whenever information is imperfect, markets are essentially never constrained Pareto efficient – in marked contrast to standard results for competitive markets with perfect information (…). Thus, the (...) argument that the argument for capital liberalization is exactly the same as the argument for trade liberalisation is simply false." (Stiglitz, 2000 : 1079). It is worth noticing that no detail is given on the very reason why market operators behavior on capital market is destabilizing, nor is given any argument why such a behavior could not be observed on "ordinary markets", except those quoted above.

We thus stick to them and wonder whether markets for information like capital and financial markets are "different animals" from over-the-counter and futures agricultural markets. To answer such a question would ideally require to compare operators behaviour on such two markets. The difficulty to conduct experiments on operators compared behaviour on a realistic sample obliges us to identify proxies of operators behaviour.

4. Linking operators behaviour with price properties

We translate markets operators behaviour into market prices behaviour and make the assumption of equivalence relationships between them. Equivalence relationships can be documented going back to Fama (1965a, 1965b). By addressing the issue of predicting price pattern on a stock market, where

[3] See for example "IMF Economic Forum – Capital Account Liberalization : What's the best Stance?", 2 Octobre 1998, IMF Washington, DC.

rational operators buy and sell in response to the arrival of new information, Fama (1965a) concluded that on such markets, a stock price should equal its intrinsic value at any point of time. A gap between these two should not last, for it signals potential profits that should rationally be seized. Dwelling on the arbitrage assumption, Fama assumed that stock prices should move randomly around their intrinsic values, when "randomly" means with some gaps ("noise") equal to zero on average and whose variance is constant over time. Predictable and rationale behaviour of operators allowed him to deduce precise properties of prices. First moment correlation should equal zero ("the actual amount of dependence may be so small as to be unimportant") and consequently no prediction of future prices should be possible on the basis of past prices. Prices have one chance out of two to rise, one chance out of two to fall. Changes on average are equal to zero. Samuelson (1965) expressed the random walk hypothesis in a similar way, when with comparable assumptions on operators behaviour – both rational and perfectly informed – he concluded that properly anticipated prices should fluctuate randomly. The kind of randomness selected for the formalisation of the random walk in stock markets has originally been, because of its statistical convenience, the normal law.

4.1. Price properties when rationality and perfect information hypothesis are violated

The rejection of the random walk hypothesis followed shortly after its formulation : Fama (1965b), Godfrey, Granger et Morgenstern (1964), and later on among many others, Mandelbrot (1963, 1997) and Lux (1998) for a survey, demonstrated that stock returns were not normally distributed. Operators were either imperfectly informed (Banerjee, 1992) or irrational (Shiller, 1989). Models of operators behaviour, either imperfectly informed or influenced by fashions and fads, convincingly demonstrated this point (Day, 1994, Lux, 1998). Models showed that an endogenous dynamics was at work on stock markets : because of imperfect rationality and/or information, operators make false expectations, panic, behave like herd, which changes the bell-shaped curve of perfect market price distribution into a fat-tailed peaked-middle curve, which in turns lead operators to make false expectation, imitation and so on. Similarly, when comparing stock price changes in Amsterdam and London in the XVIIIth and XXth century, Harrison (1998) concluded : "Distributions of percentage price changes from eighteenth- and twentieth-century stock markets exhibit common regularities despite the many important institutional, social, and technological changes over the last 300 years. In particular, the eighteenth-century series differ from the normal distribution in the typical fat-tailed and peaked middle characteristic of modern data (...). This suggests a commonality in the way behaviour become translated into prices in the stock market" (Harrison, 1998 : 55, 78). This allows us to assume that operators behaviour destabilising capital market are reflected in the distribution and in the dynamics of price changes. And that behavioural indicators of prices do provide information on operators behaviour as well.

4.2. Behavioural Price Indicators

Assuming that herd behaviour, panics, crashes, and destabilising speculation are, first, responsible of market instability after Bhagwati, and second, that they are documented by price properties, we define behavioural indicators of prices so as to encompass a wide range of operators behaviours. We particularly seek statistical indicators of volatility patterns escaping from the normal law, random walk hypothesis where volatility is assumed constant over time and prices dynamics is linear. To complement non-normality tests and distribution description parameters, we select two sets of description parameters to account for time-varying volatility, likely to generate booms and busts, panics and crashes, through fat-tailed and peaked middle distribution of prices. First, stochastic non-linearity parameters are capable to explain non-normal distributions and exaggerated (non commensurate) price changes. ARCH test and HSIEH tests provide some indication of cumulative effects in volatility. Significant values indicate time-varying volatility, meaning that a large price change is followed by another large change and a small change is followed by another small change.

Second, chaos measures and tests allow us to identify deterministic non-linearity patterns, with possible long memory processes and autocorrelations decaying to zero very slowly. The three sets of indicators are detailed in table 1. Critical value and test descriptions are given in the table references. A clear and pedagogical description can be found in Wei and Leuthold (1998).

Table 1. Price Behavioural Indicators

Set of indicators	**Test or measure**
Distribution	1. Kurtosis 2. Characteristic Exponent 3. Chi² test (normality test) 4. Kolmogorov-Smirnov test (normality test)
Non-linearity	5. Arch test (correlation test for second moment) 6. Hsieh test (correlation test for third moment)
Chaos	7. Lyapunov Exponent (sensitivity to initial conditions) 8. Dimension of Grassberger and Procaccia (attractor's dimension) 9. BDS test (independence test)

Sources : 2. Nolan (1997), 5. Engle (1982), 6. Hsieh (1989), 7. Wolf et al. (1985), 8. Grassberger and Procaccia (1983), 9. Brock et al. (1987, 1991)

4.3. Data

Selection criteria for the data have been their representing the main financial and agricultural markets activity, and their length (for both methodological and statistical reasons in a long-period comparison). Financial data cover both US and European markets. Capital data cover Japan and European exchange rates, as well as South-East Asia exchanges rates for the arguments they provide against free trade in capital flows. Agricultural data cover annual and perennial crops, tropical and tempered products. They all form an original dataset describing market activity as of 1800 for the longest time series (table 2). Nearby contracts are used to construct long time futures series. When available, daily, weekly and monthly prices are investigated. The monthly data are the prices of the last day of every month, the weekly data are the Friday prices of every week, the daily prices are closing prices of every trading day.

Financial series selected are the Dow Jones Index of Industrial Values (02/01/1930 to 15/11/1991 daily, 01/01/1900 to 15/11/1991 weekly, Jan. 1900 to Dec. 2000 monthly), CAC 40 Futures (18/08/1988 to 29/12/2000 daily), exchange rate in US $ of Yen, British Pound, French Franc (04/01/1971 to 29/12/2000 daily), Malaysian Ringgit, Thailand Baht (04/01/1993 to 29/12/2000 daily), Indonesian Rupiah, Philippine Peso, Russian Rubble (17/11/1995 to 04/03/1999 daily), Brazilian Real (16/7/1996 to 4/3/1999 daily).

Agricultural series are cocoa and coffee futures (04/01/1989 to 28/04/2000 daily), rape futures (28/10/1994 to 28/12/2000 daily), crude palm oil futures (06/12/1980 to 23/10/2000 daily) and spot (Jan. 1818 to Dec. 1999 monthly), sugar, corn and soya futures (04/01/1993 to 28/12/2000 daily), sugar spot (Jan. 1800 to Jan. 2001 monthly).

Table 2 : Data description

Financial series	**Freq.**	**Beginning**	**End**	**Source**
Dow Jones Industrial Average	Daily	02/01/1930	15/11/1991	http://www.ibiblio.org/pub/archives/misc.invest/historical-data
Dow Jones Industrial Average	Weekly	01/01/1900	15/11/1991	http://www.ibiblio.org/pub/archives/misc.invest/historical-data
Dow Jones Industrial Average	Monthly	Jan 1900	Dec 2000	http://www.ibiblio.org/pub/archives/misc.invest/historical-data and http://www.economagic.com/em-cgi/data.exe/sp/sp14
CAC 40 Futures	Daily	18/08/1988	29/12/2000	Paris Matif http://www.matif.fr
Exchange rate Yen/US$	Daily	04/01/1971	29/12/2000	http://pacific.commerce.ubc.ca/xr/data.html
Exchange rate £/US$	Daily	04/01/1971	29/12/2000	http://pacific.commerce.ubc.ca/xr/data.html
Exchange rate French Fr/US$	Daily	04/01/1971	29/12/2000	http://pacific.commerce.ubc.ca/xr/data.html
Exchange rate Mal. Ring./US$	Daily	04/01/1993	29/12/2000	http://pacific.commerce.ubc.ca/xr/data.html
Exchange rate Thai. Bat./US$	Daily	04/01/1993	29/12/2000	http://pacific.commerce.ubc.ca/xr/data.html
Exchange rate Indo. Rup./US$	Daily	17/11/1995	04/03/1999	http://pacific.commerce.ubc.ca/xr/data.html
Exchange rate Phil. Peso/US$	Daily	17/11/1995	04/03/1999	http://pacific.commerce.ubc.ca/xr/data.html
Exchange rate Russian R./US$	Daily	17/11/1995	04/03/1999	http://pacific.commerce.ubc.ca/xr/data.html
Exchange rate Braz. Re./US$	Daily	16/7/1996	04/03/1999	http://pacific.commerce.ubc.ca/xr/data.html
Agricultural series	**Freq.**	**Beginning**	**End**	**Source**
Cacao Futures	Daily	04/01/1989	28/04/2000	New York Board of Trade
Coffee Futures	Daily	04/01/1989	28/04/2000	New York Board of Trade
Rape futures	Daily	28/10/1994	28/12/2000	Paris Matif http://www.matif.fr
Crude palm oil Futures	Daily	06/12/1980	23/10/2000	Kuala Lumpur Commodity Exchange
Sugar Futures	Daily	04/01/1993	28/12/2000	Tokyo Grain Exchange, http://www.tge.or.jp
Corn Futures	Daily	04/01/1993	28/12/2000	Tokyo Grain Exchange, http://www.tge.or.jp
Soya Futures	Daily	04/01/1993	28/12/2000	Tokyo Grain Exchange, http://www.tge.or.jp
Sugar spot	Monthly	Jan 1800	Jan 2001	Piketty M-G, Boussard J-M (2002)
Crude palm oil spot	Monthly	Jan 1818	Dec 1999	Voituriez T (2001)

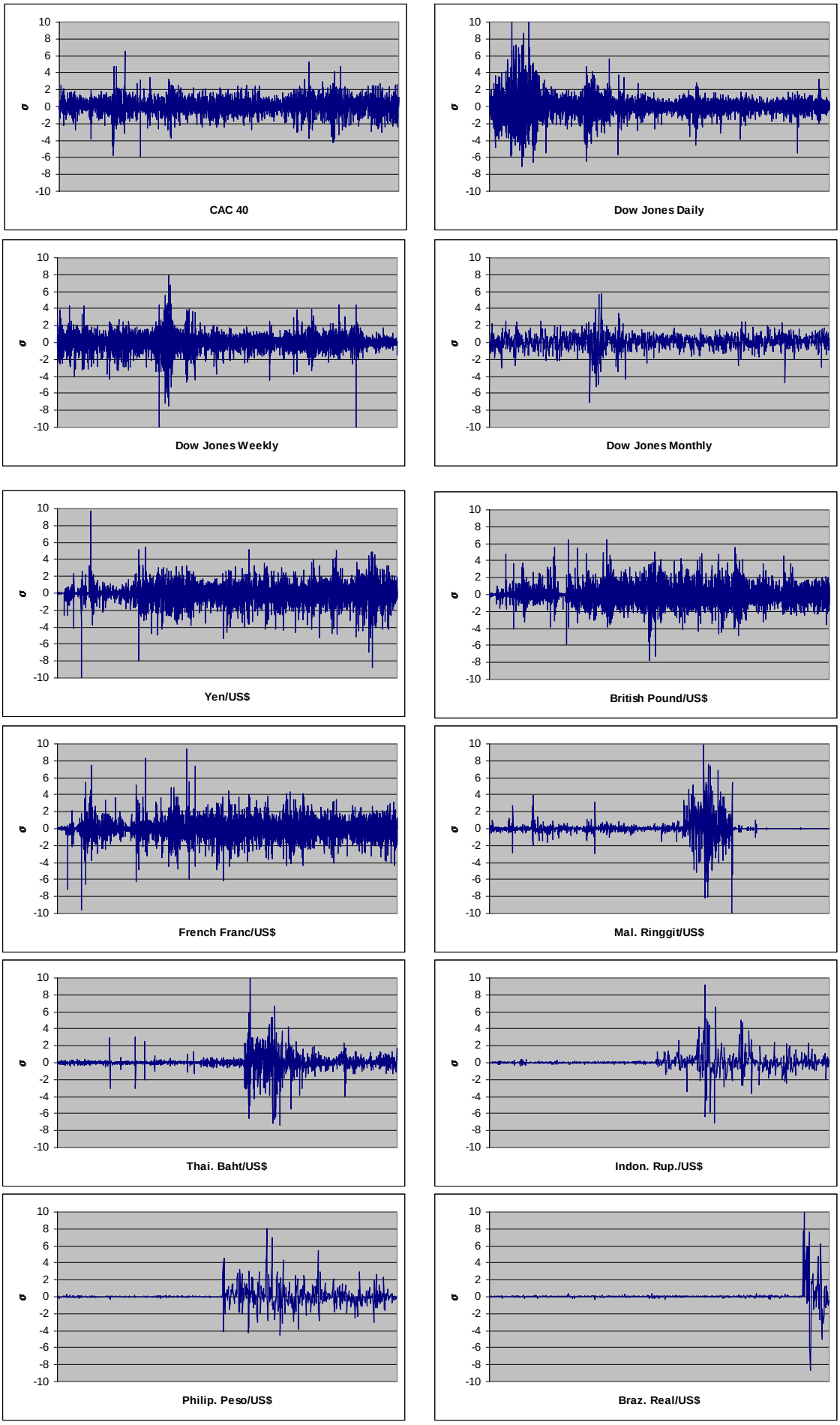

Figure 1. First difference of log prices, 22 series

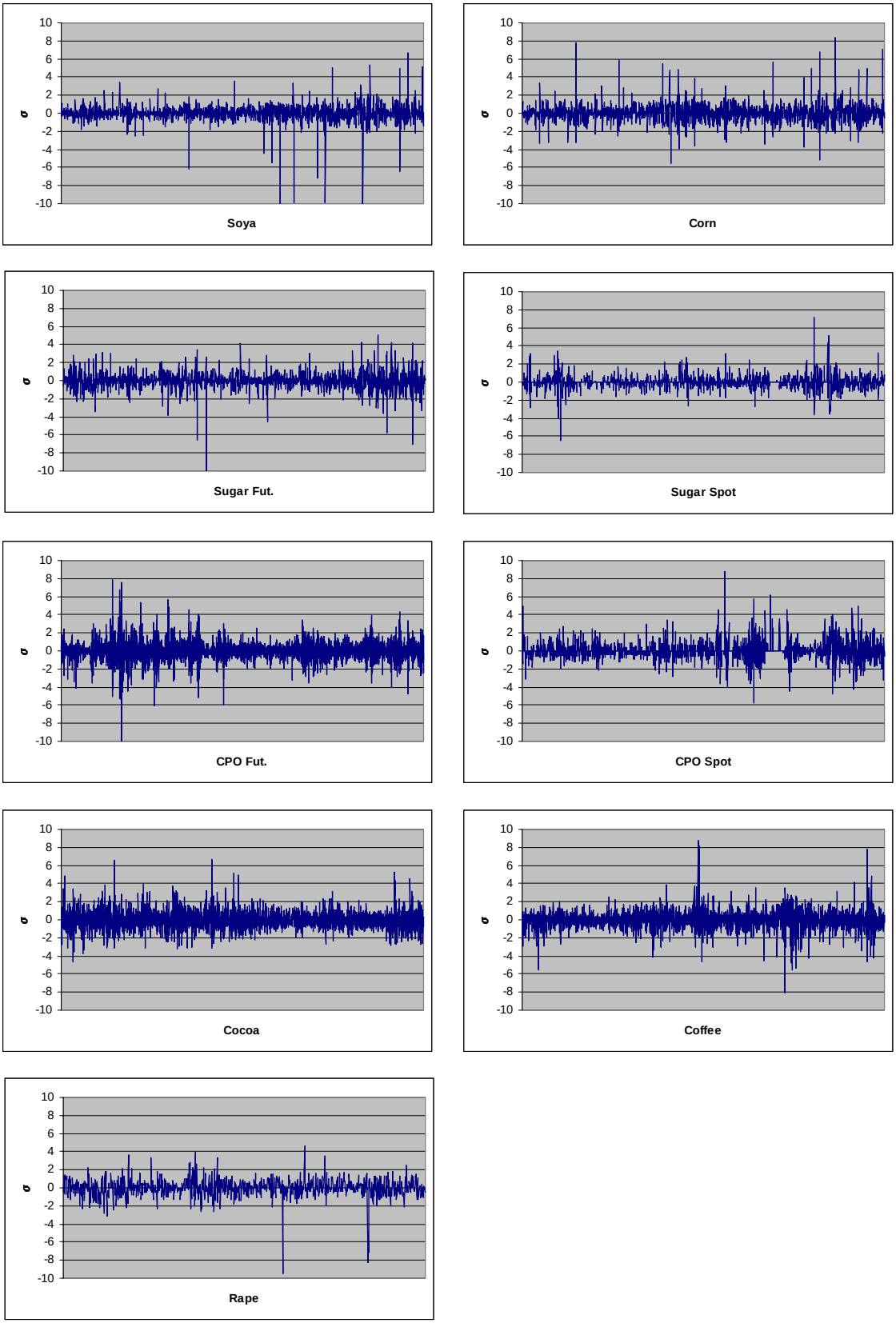

Figure 1 (cont'd). First difference of log prices, 22 series

5. Results

All the series exhibit a unit-root according to the augmented Dickey-Fuller test and are stationarised through first difference in their log values[4] (figure 1). Results are detailed in table 3.

5.1. Financial series

Results on financial series confirm markets behaviour stigmatised by Bhagwati (table 3):

- *Distribution* displays an above-normal rate of extreme values, with kurtosis ranging between 7,5 (£/US$ exchange rate) and 62,2 (BRe/US$). The distribution is significantly non normal, fat tailed, while the characteristic exponent isolates possible infinite mean ($\alpha < 1$) for MaR/US$, TBa/US$, IRp/US$, PPe/US$, RRo/US$, BRe/US$ exchanges rates, and possible infinite variance ($1 < \alpha < 2$) for the remaining series. This confirms early findings of Mandelbrot (1963) and Fama (1965b) of sudden disruption in mean and variance, characterising non-gaussian probabilities distribution. With non-gaussian risk, market volatility varies considerably over time, depending on the sample size on which it is assessed, and making inefficient risk management strategies like "stop loss" developed for a Gaussian, constant-volatility universe.

- *Nonlinearities* are significant in series dynamics, underlying incommensurate market reaction to fundamentals. Stable periods succeed to unstable periods (correlation in variance and third-order moment) with no average volatility stationary over time. Nonlinearities have been widely used to explain bubbles, manias and panics (Kindleberger, 1996), disconnecting market price changes to market fundamentals from time to time so that « *we do not find, as the root-cause of a crash, any catastrophic information on fundamentals"* (Charlety-Lepers and Portait, 1997 : 855). Traders overreaction to "good news" and "bad news" lead to unpredictable and sudden upswing and downswing in price volatility.

- *Chaos*, viz deterministic behaviour of prices embedded into a finite-dimension attractor seems unlikely expect for Yen/US$, £/US$, FF/US$ where the GP dimension is low and BDS test significant, which are the two conditions for detectable chaos. This result deserves attention : chaos means both local instability and global stability, which leads to the conclusion that chaotic prices are globally stable : they do not get out of a "box" (the embedding dimension), while non-chaotic, locally instable prices, fluctuate with no limitations (in the mathematical sense). Global stability is not found in emerging countries exchange rate, which noticeably experienced crashes in the last decade.

5.2. Comparison with agricultural series

- *Distribution*. Financial and agricultural series are both significantly non normal, with a kurtosis greater than 3 and a characteristic exponent ranging from 1.1 (sugar spot) to 1.8 (rape futures) on agricultural series. Spot prices are more leptokurtic and display more clearly time-varying, infinite variance (α closer to 1 than to 2) than futures prices, which is too a result we have on financial markets according to our findings (futures on CAC 40 are the closest to the normal law). With no statistical significance because of too small a sample, this provides however plausible assumptions of price-stabilising futures markets where stability is assessed with reference to the normal law.

[4] After Geiss (1995), Wei and Leuthold (1998) discuss the biasness the various methods of constructing long price series can create. When applying Arch, long memory and chaos to the three major transformations – differences, log differences and the rate of returns – results in general remains unchanged according to their finding. Nonlinear time series models discussed here are not very sensitive to these specific transformation procedures.

- *Nonlinearity*. Correlation in 2nd moment is shared by the two sets of series. Correlation in 3rd moment is found in more than 75% of series in each set. This result underlines the existence of a powerful stochastic non-linear dynamics, with time-varying volatility, in the two types of markets. Overreaction, bubbles and crashes are too a characteristics of agricultural markets in our set.

- *Chaos*. Results are comparable : all series are locally unstable, without being embedded in a low-dimension attractor (to the exception of sugar spot for which the GP dimension is lower than 3). Series are not self-stabilising at the global (market) level in the chaos-sense.

To summarise, results on capital and financial series demonstrate nonlinear dynamics in prices, with time-varying volatility likely to formalise booms and busts, panics and crashes. Series in log difference are not normally distributed, they are fat tailed, they exhibit nonlinearities both through correlation of second and third moments, and last, they are close to chaos without being all explicitly chaotic. Such properties are identically found in agricultural series for at least 75% of the series investigated. On the basis of the 9 indicators and series selected, no significant distinction can be made between financial and capital market, with agricultural markets behaviour over time.

5.3. Discussion

Our basic finding is that on the data set and indicators selected, and with the assumptions of particular relationships between operators behaviour and price properties, operators behaviour leading to "panics, crashes, destabilizing speculation" according to Bhagwati's arguments against free trade in capital are characterising operators behaviour on agricultural markets as well. Does such a result make a case against free agricultural trade? Of course not, because such a question cannot be answered on the basis of price properties only. Developing further the comparison between capital and agricultural markets helps to precise what could be trade policy implications and what should not. Two questions arise. Are the causes of market instability the same, and are consequences the same. Trade restrictions in capital, urged for by free-trader economists, rely indeed, beside market behaviour itself, on the endogenous pattern of instability on the one hand, and on the social cost of instability at the national and even global level on the other hand.

Let us turn to the causes first. Without clearly identifying them, Bhagwati's mention of imperfect information, leading to "destabilising speculation, herd behaviour and so on" and explaining time-varying volatility makes it one of the root-causes of capital market instability. This view is shared by Stiglitz (2001) also and by recent papers formalising stylised market behaviour with endogenous uncertainty (see for example Wu and Guo, 2003).

Agricultural economists for sure are more familiar with exogenous uncertainty. Price instability is most of the time considered as a consequence of external shocks like climatic disturbances. Several authors have shown however that endogenous prices fluctuations may be generated by deterministic models including liquidity constraint, imperfect information and risk aversion resulting into destabilizing expectation (Boussard, 1996, Day 1999, Rosser 2000, Boussard, Gerard, Piketty, Christensen, Voituriez, 2003). Discrepancy between market fundamentals and market price changes is now documented, reducing the explanatory power of exogenous shocks : in a purely deterministic model, Voituriez (2001) showed that time-varying volatility in world vegetable oil market was induced by traders different expectation horizons, Roll (1984) empirically found that only a small fraction of price variation for frozen orange juice in the US could be explained by fundamentals such as the weather, while Pindyck and Rotemberg (1990) found high levels of price correlation across commodities that are inconsistent with prices driven solely by fundamentals. Endogenous uncertainty leading to destabilising expectations and vice versa are common features of financial and agricultural markets. Agricultural exchanges, like any other exchanges, are "different animal" because they are information markets. This remains compatible with Bhagwati's assertion.

Table 3 : Comparison results

	DISTRIBUTION				NON-LINEARITIES		CHAOS		
Series	**Kurt**	**Normality Chi²**	**Normality K-S**	**Char. Exp.**	**2nd moment**	**3rd moment**	**Lyap.**	**Attractor (dim GP)**	**BDS**
Finance									
DJIA daily	32.817	5205.422***	0.0918***	1.368	0.0507***	<0.01	>0	5.346 (0.06)	1.405**
DJIA week.	19.569	835.0586***	0.0678***	1.633	167.4***	<0.01	>0	5.162 (0.16)	3.625E-01
DJIA month.	9.598	133.7384***	0.0724***	1.705	23.64***	<0.01	>0	2.475(0.225)	5.40E-01
CAC 40 fut.	5.834	97.4529***	0.0386***	1.852	50.3328***	<0.01	>0	5.742 (0.24)	8.24E-01
Yen/US$	15.956	737.4579***	0.0314***	1.511	111.3905***	NS	>0	1.83 (0.13)	-1.005*
£/US$	7.525	1451.752***	0.0809***	1.49	137.473***	<0.01	>0	2.68 (0.92)	3.0846***
FF/US$	9.094	1118.359***	0.0764***	1.522	100.0688***	<0.01	>0	2.46 (0.23)	-1.003*
MaR/US$	26.22	268.1673***	0.0611***	0.891	63.3891***	<0.01	>0	5.71 (0.44)	-2.371***
TBa/US$	59.494	1205.989***	0.2466***	0.892	37.4983***	<0.01	>0	5.6 (0.33)	4.617***
IRp/US$	24.275	814.6725***	0.2234***	0.901	106.2209***	NS	>0	5.41 (0.48)	4.37E-01
PPe/US$	15.894	418.1245***	0.1819***	0.621	51.9628***	<0.01	>0	5.54 (0.51)	-1.007*
RRo/US$	51.324	1753.597***	0.3286***	0.89	112.8116***	NS	>0	5.46 (0.44)	-2.374***
BRe/US$	62.269	919.0891***	0.3307***	0.881	30.4679***	NS	>0	5.4 (0.09)	2.023**
Agriculture									
Cocoa fut.	6.175	147.278***	0.03991***	1.512	2.7627*	<0.01	>0	5.972 (-)	-1.524***
Coffee fut.	11.97	220.5875***	0.0667***	1.489	30.7769***	<0.01	>0	6.19 (0.219)	1.3587**
Rape fut.	116.94	126.4674***	0.0739***	1.7864	11.18***	<0.01	>0	6.56 (-)	4.7433***
CPO fut.	26.717	430.281***	0.0595***	1.5019	113.6586***	<0.01	>0	6.059 (-)	4.079**
CPO spot	10.589	954.446***	0.2077***	1.30	45.877***	<0.01	>0	5.96 (-)	8.54***
Sugar fut.	23.705	283.8454***	0.0882***	1.5423	17.8949***	<0.01	>0	5.666 (0.51)	1.0438*
Sugar spot	12.498	1151.319***	0.01611***	1.132	44.577***	NS	>0	1.35 (0.45)	2.792***
Corn fut.	13.68	187.4162***	0.06274***	1.703	51.01***	<0.01	>0	5.957 (0.33)	2.05E-01
Soya fut.	110.92	163.9741***	0.0507***	1.6577	4.4707**	<0.01	>0	6.102 (-)	4.07E-01

*** 1% signif ; ** 2.5% signif. ; * 5% signif. , otherwise mentioned, NS for non significant. Significant values given in table 1 references.

Tests are conducted on log differences of prices, except when specified :

K-S for Kolmogorov-Smirnov normality test

Char. Exp. provides the characteristics exponent value α in the log of the characteristics function :

$$\log\phi(t) = i\delta t - c\left|t^{\alpha}\left[1 + i\beta\left(\frac{t}{|t|}\right)\left(\tan\frac{\pi\alpha}{2}\right)\right]\right| \text{ with } 0 < \alpha \le 2, -1 \le \beta \le 1, \delta \in \Re, c \ge 0$$

The 2nd moment test Auto Regressive Conditional Heteroscedasticity (ARCH(1)) whose critical value is $\chi^2(1)$

The 3rrd moment test value is given by $t - stat = \dfrac{T^{-\frac{3}{2}} r_{xxx}(i,j)\left[\sum_t x^2{}_t\right]^3}{\sum_t x^2{}_t x^2{}_{t-i} x^2{}_{t-j}}$ where T is the length of the time series, r_{xxx} the correlation coefficient of order 3 assumed to follow a normal low of mean 0 and variance equal to $\left[\sum_t x^2{}_t x^2{}_{t-i} x^2{}_{t-j} / T\right] / \left[\sum_t x^2{}_t / T\right]^3$

The Lyapunov exponent computation is derived from Wolf, Swift, Swinney, Vastano (1985)

The attractor dimension is derived from Grassberger and Procaccia (1983)

The BDS tests follows Brock, Dechert, Scheinkman (1987) with significant values provided by Brock, Hsieh, LeBaron (1991) for auto-regressive (AR) log difference series filtered for garch(1,1) effects.

Are the consequences the same? The phenomenon at stake, justifying trade restriction, is the risk of market disruption free capital trade may induce, which in turn would be likely to generate welfare losses at national and/or global level. This is not exactly what we have in mind when thinking about agricultural market instability. What is at stake first is more sudden price upswings and downturns than agricultural trade flow disruption per se, even if flows and prices are linked through market. Second, macro consequences of capital market disruption seems unlikely to be found after one agricultural particular product price has collapsed or sky-rocketed. Although these common-sense remarks urge for caution when assessing Bhagwati's arguments within an agricultural policy arena, they can be moderated by some salient findings in agricultural economics literature.

Negative macro consequences of agricultural price instability was demonstrated by Timmer (2001) and Dawe (2001) for developing Asia, where stabilisation schemes – although imperfect - enabled farmers to invest, increase labour productivity and food supply, which in turn reduces consumer prices, poverty and inflation. A huge body of literature isolates agricultural price-induced terms of trade volatility as a significant factor reducing growth, through its effect either on investment and saving instability (for recent findings and survey, see Turnovsky and Chattopadhyay, 2003). When terms of trade is stochastic, Turnovsky (1974) claimed : "The expected gains from trade for a risk averse country, which under certainty, would switch to trade, may, under uncertainty become negative, causing it to cease trading". Turnovsky's intuition is that if external price variability is the only source of uncertainty and it, therefore, occurs only when the country is engaged in foreign trade, then with strong risk aversion in preferences, the country's expected utility might be lower under free trade than under autarky. Pomery (1984) noted in the same line that "Newberry and Stiglitz (1981) gave an example, where with incomplete markets, free trade may be Pareto-dominated by autarky, an idea which has been adopted by Eaton and Grossman (1981) to give a second-best argument for tariffs as a form of insurance when internal markets are incomplete". We are not very far here from Bhagwati's analysis and recommendation indeed.

6. Conclusion

The question addressed was to know whether the arguments against complete free trade made after Bhagwati should be restricted to capital market. To answer we have assumed equivalence relationships between operators behaviour and price behaviour on a given market. Then we have compared the dynamic properties of agricultural and financial and capital markets on an original set of data.

Focusing on 22 prices series and 9 behavioural indicators, our basic findings are that under the assumptions of particular relationships between operators behaviour and price properties, operators behaviour making against free trade in capital are characterising operators behaviour on agricultural markets as well. The prominent role of risk and uncertainty in operators expectations on such two markets provides a plausible explanation of this finding, making these two markets different from manufactures where no OTC or exchanges adjusts prices daily.

Although causes and consequences of market instability makes the capital case not exactly comparable with the agricultural case, strong similarities and evidence in agricultural economics literature leaves unexpected room for Bhagwati's arguments against free trade to be replicated in agriculture. Agricultural trade, as capital flows, may require short-term public intervention to mitigate detrimental effects of market instability and reduce the social cost of uninsurable risk involved by complete free trade.

Further and cautious transposition of the capital market case would suggest some changes in WTO disciplines. Focusing on the reduction of terms-of-trade externalities in large countries through the removal of insulating policies (Bagwell and Seiger, 1999), WTO discipline does not tackle terms-of-trade instability as such, leaving room for large countries to resort to distorting, special safeguard measures, while preventing developing countries from doing so as long as they bounded their tariffs at

ceiling rates. This asymmetry makes it possible for large countries to export their instability and disrupt market on a temporary basis, while restricting small countries ability to stabilise their own. If according to our results risk-reducing, short-term interventions are very likely to occur on uninsurable markets as agricultural markets do seem to be, a more balanced discipline on short-term policy measures would be required in WTO, so as to reduce large countries capacity to export their home grown volatility, while leaving the possibility for small (price taking) countries to resort to stabilising tariffs like variable levies. Such instruments, when properly designed, protect against imported volatility without exporting the home grown volatility (Nordström, 2001 ; Shikha Jha, Srinivasan, 2001). Similarly Chile did so when successfully imposing a tax to stabilise short-term capital inflow.

References

Bagwell K., Staiger R. (1999). An Economic Theory of GATT, American Economic Review; 89(1), 215-48.

Bale, M. and Lutz, E. (1979). The Effect of Trade Intervention on International Price Instability. *American Journal of Agricultural Economics*, 61(3) : 512-516.

Bhagwati, J. (1998a). The Capital Myth. *Foreign Affairs* May/June : 7-12.

Bhagwati, J. (1998b). IMF Economic Forum on Capital Account Liberalization : What's the Best Stance. 2 October1998. IMF. Washington DC, mimeo.

Bhagwati, J. (2002). Wanted : Jubilee 2010. Dismantling protection. *Oecd Observer*, June 26.

Black, F. (1976). The Pricing of Commodity Contracts. *Journal of Financial Economics*, 3 : 167-179.

Black, F. and Scholes, M. (1973). The Pricing of Options and Corporate Liabilities. *Journal of Political Economy*, 81 : 637-654.

Boussard, J.M., Gerard, Fr, Piketty, M.G., Christensen, A.K.C., Voituriez, T. (2004). May the pro-poor impacts of market liberalisation vanish because of imperfect information ? Agricultural Economics, forthcoming.

Brock, W.A., Dechert, W.D. and Scheinkman, J.A. (1987). A Test of Independence Based on the Correlation Dimension. Working Paper 8702. Social Systems Research Institute. University of Wisconsin-Madison.

Brock, W.A., Hsieh. D.A. and Le Baron. B. (1991). *Dynamics Chaos and Instability : Statistical Theory and Economic Evidence*. MIT Press.

Charlety-Lepers P., Portait R. (1997), « Assurance et couverture de portefeuille, volatilité des prix et stabilité des marchés financiers », *Revue Economique* 48(4) : 853-868.

Cootner, P.H. (1962). Stock Prices : Random Walk vs. Systematic Change. *Industrial Management Review*, vol. 3 : 24-45.

Dawe, D. (2001). How far down the path to free trade? The importance of rice price stabilization in developing Asia. Food Policy 26(2001) : 163-175.

Day R.H. (1999): *Complex Economic Dynamic* volume II : An introduction to Macroeconomic Dynamics,. The MIT Press, Cambridge, Massachusetts.

Demirgüc-Kunt A., Detragiache E. (1998). Financial liberalization and financial fragility. In Proceedings of Annual Bank Conference on Development Economics, Washington, DC, 20-21 April.

Easterly W., Islam R., Stiglitz J. E. (1999). Shaken and stirred: volatility and macroeconomic paradigms for rich and poor countries. Given as Michael Bruno Memorial Lecture, International Economics Association World Congress, Buenos Aires.

Eaton, J., Grossman, G.M. (1981). Tariffs as Insurance : Optimal Commercial Policy when Domestic Markets are Incomplete. NBER Working Paper 797.

Engle, R. (1982). Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation. *Econometrica*, 55 : 391-407.

Fama, E.F. (1965a). Random Walks in Stock Market Prices. *Financial Analyst Journal,* Sept/Oct : 55-59.

Fama, E.F. (1965b). The Behavior of Stock Market Prices. *The Journal of Business*, vol. 38. Jan : 34-105.

Geiss, C.G. (1995). Distorsion-Free Futures Price Series. *The Journal of Futures Markets*, 15 : 805-831.

Godfrey, M.D., Granger C.W.J. and Morgenstern O. (1964). Spectral Analysis of New York Stock Market Prices. *Kyklos,* vol. 16 : 1-27.

Grassberger, P. and Procaccia, I. (1983). Characterization of Strange Attractors. *Physical Revue Letters*, 50. 448-451.

Harrison, P. (1998). Similarities in the Distribution of Stock Market Price Changes between the Eigtheenth and Twentieth Centuries. *Journal of Business,* 71(1) : 55-79.

Hennessy, D.A. (1998). The production effects of agricultural income support policies under uncertainty. *American Journal of Agricultural Economics*, 80 : 46-57.

Hsieh, D.A. (1989). Testing for Nonlinear Dependence in Foreign Exchange Rates. *Journal of Business*, 62 : 339-368.

Kindleberger, C.K., 1996, *Manias, Panics and Crashe*s, MacMillan : Londres.

Krugman, P. (1999). The Return of Depression Economics. *Foreign Affairs,* January/February : 56-74.

Lux, Th. (1998). The socio-economic dynamics of speculative markets : interacting agents. chaos. and the fat tails of return distributions. *Journal of Economic Behavior and Organization*, 33. 143-165.

Mandelbrot B. (1997). *Fractales, hasard et finance*. Flammarion. Paris.

Newberry, D.M.G., Stiglitz, J. (1981). *The Theory of Commodity Price Stabilisation : a Study in the Economics of Risk*, Oxford, Oxford University Press.

Nolan, J.P. (1997). Numerical calculation of stable densities and distribution functions. *Commun. Statis. And Stochastic Models* 13(4) : 759-774.

Nordström H. (2001). Do variable levies beggar thy neighbour? *European Journal of Political Economy* 17 : 403-420.

Piketty, M.G. and Boussard. J.M. (2002). Conséquences possibles de la libéralisation des échanges de sucre. *Economie Rurale*, 270 : 3-18.

Pomery, J. (1984). Uncertainty in Trade Models, in R.W. Jones and P.B. Kenen (eds) *Handbook in International Economics*, vol I. Amsterdam : North Holland.

Rodrik, D. (1998). Who Needs Capital-Account Convertibility? In Fischer. S. Cooper. R N. Dornbusch. R. Garber P.M.. Massad C.. Polak J.J.. Rodrik D. and Savak S. Tarapore. *Should the IMF Pursue Capital-Account Convertibility?*. Essays in International Finance 207. May 1998. International

Finance Section. Department of Economics. Princeton University. Princeton. New Jersey : 55-65.

Rosser, J.B. (2000). *Between Cambridge and Vienna : The risky business of new Austrian business cycle theory.* Mimeo, James Madison University, Harrisonburg (Va)

Shrikha Jha, P.V. Srinivasan (2001). Food Inventories Policies under Liberalized Trade. *International Journal of Production Economics* 71 : 21-29.

Stiglitz, J. (1998). The Role of International Institutions in the Current Global Economy. The World Bank. Adress to the Chicago Council On Foreign Relations. The World Bank. Washington. DC.

Stiglitz, J. (2000). Capital Market Liberalization. Economic Growth and Instability. *World Development*, Vol. 28(6) : 1075-1086.

Timmer, P. (2000). Agriculture and economic development. In: Gardner, B.L., Rausser, G.C. (Eds.), Handbook of Agricultural Economics. Elsevier Science, Oxford.

Tyers, R. and Anderson K. (1992). *Disarray in World Food Markets*. Cambridge: Cambridge University Press.

Turnovsky, S.J. (1974). Technological and Price Uncertainty in a Ricardian Model of International Trade. *Review Economic Studies*, 41 : 201-17.

Turnovsky, S.J., Chattopadhyay, P. (2003). Volatility and Growth in Developing Economies : Some Numerical Results and Empirical Evidence", *Journal of International Economics* 59 : 267-295.

Unctad (2002). Farmers and farmers' associations in developing countries and their use of modern financial instruments. Study prepared by the Unctad Secretariat. UNCTAD/ITCD/COM/35, Unctad, Geneva.

Vanzetti, D. (1998). Global Stocks, Price Stability and Food Security. Report No. 95, Danish Institute for Agricultural and Fisheries Economics, Copenhagen.

Voituriez, T. (2001). What explains price volatility changes in commodity markets ? Answers from the world palm-oil market. *Agricultural Economics*, 25. 295-301.

Wei A. and Leuthold R.M. (1998). Long Agricultural Futures Prices : Arch, Long Memory, or Chaos Processes? OFOR Paper 98-03, May.

Williams, J.C. (1982). The origin of futures markets. *Agricultural History*, Jan : 306-316.

Wolf, A., Swift, J.B., Swinney H.L. and Vastano, J.A. (1985). Determining Lyapunov Exponents from a Time Series. *Physica* 16D : 285-317.

World Bank (1994). *Global Economic Prospects and the Developing Countries*. The World Bank. Washington, DC.

World Bank (1999). *Dealing with Commodity Price Volatility in Developing Countries : A Proposal for a Market-Based Approach*. The World Bank. Washington, DC.

Wu,-Ho-Mou; Guo,-Wen-Chung (2003), Speculative Trading with Rational Beliefs and Endogenous Uncertainty. Economic-Theory. March 2003; 21(2-3): 263-92.