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What Drives Profits ?

An income – spending model

by

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SHORT ABSTRACT

This paper investigates the relationship all the different types of income and their uses in the case of the United States, from 1954 to 2004. To this end we use an a-theoretical approach and estimate a large-scale error-correction system with special attention on profits. The dynamics of the system are studied along the five different concepts of 'business cycle' Granger causality, 'disequilibrium causality', 'short run causality', 'long run variance causality' and 'impact causality'. Special attention is set on definitions and methodology. Our main findings are that profits are better understood as an adjusting variable, mostly reacting to consumption patterns and policy choices. [word count : 105].

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INTRODUCTION :

The present paper is an attempt to inquire into the role and determinants of aggregate profits. It has been motivated by what has been dubbed the New Consensus in growth theory (Romer [2000], Taylor[2000], Stockhammer[2004], Kriesler and Lavoie[2005]) which relies on the fundamental postulate of a dual temporal nature of the economy. In the short run, the economy is seen as in a Keynesian (or demand-led) disequilibrium but in the long run, supply factors *only* drive the economy along a natural growth path. The focal point of the New Consensus approach is to study the conditions, such as economic policy rules, under which the short run disequilibrium would disappear and the "classical" or "new Wicksellian" equilibrium path would be restored. The New Consensus approach –at least its long run part– seem to be espoused by a growing fraction of the American business community, as documented in Ferguson [1995].

Along this uniquely determined long run growth path, capital accumulation (investment) plays the major role of the leading variable and especially determines effective growth in production and therefore of consumption. The classical law of thriftiness rules and investment is here being funded by savings ; the causality runs from the amount of available savings to the level of investment. Since such savings primarily come from savings out of profits, the amount of profits determines savings, therefore investment, therefore growth. The bottom line of this approach is that profits are the exogenous factor in the sense of being the central variable which propels the rest of the economic system and profits in the next period.

From this set of theoretical propositions stems a whole policy agenda. The New Consensus typically views economic policies as curative action in the short run only because in the long run economic policies are ineffective and the economy is on its equilibrium path. In a sense economic policies should only be done to correct for the short run market imperfections which are brought by Keynesian deviations. The sole role of monetary and fiscal policies is to enforce a smooth short run adjustment of the economy on its natural long run growth path. This is commonly understood as a zero-inflation target for monetary policy because such is the natural level of the interest rate matching savings (profits) to capital accumulation. It also implies a supplementary fiscal policy aiming at balanced budgets or even surpluses –as they are (public) saving. This is especially true in the case of 'excess consumption' yielding to a shortage of private savings.

Another view of the relationship between profits and macroeconomic policy, when the economy operates in excess capacity, has been spelled out under the title of the 'Profit Paradox' (Parguez[2002, 2005]). This approach challenges the New Consensus view of economic policy on the basis that such a savings target will merely generate a lesser amount of consumption and is far from certain to raise investment in return. In the end, aggregate demand and production and employment are squeezed, so that the New Consensus theory is likely to miss its long run equilibrium, should its policy recommendations be effectively implemented.

Starting from a generalized Post-Keynesian approach the ‘Profit Paradox’ spells out three fundamental and interrelated propositions (1) ‘in the long run you are still in the short run’, so that the short / long run dichotomy does not make much sense beyond logical construction, (2) profits are demand-driven in the short run and in the long run, and therefore (3) The New Consensus theory raises a deep Profit Paradox in the sense that its agenda is more likely to squeeze profits than promote them.

Such is the conflicting framework of the New Consensus and Profit Paradox theories. The present paper leaves theory aside for a time and concentrates upon shedding a new light from an empirical perspective. Our goal is to study the real world behavior of profits, through the lens of a large-scale econometric model that relies upon the less possible theoretical or restrictive assumptions. To this end we study corporate profits in the American economy from 1954 to 2004, as featured in the National Income and Product Accounts (NIPAs) of the United States.

Not much previous work has been done in that particular direction. Asimakopulos [1983] for instance provides an empirical investigation of American profits ; yet this enquiry rests upon a postulated Kalecki/Levy equation for profits and a statistical treatment of it –which lacks the dynamics approach permitted by modern econometrics. The profit theme frequently appears at the Federal Reserve (Burke [1973], Uctum [1995], Himmelberg et al. [2004], McGrattan & Prescott [2005] and the references therein) yet much of those contributions are more centered around distributional or measurement implications than we presently are.

The rest of the paper is organized as follows. Part one presents the motivation behind the choice of variables, their properties and the error-correction econometric model which make up the non-partisan framework of the analysis. Part two addresses the dynamics of the model and especially the issue of causality through the various channels and meanings allowed for by the model. Part three sums up the results and provides conclusive directions.

I. BUILDING A REAL WORLD MODEL FOR PROFITS

This section is devoted to build a framework for profits (and any other variable of the model) that is empirical in nature and most global in perspective. Two crucial decisions have to be made : choosing the variables affecting profits, and choosing a technique allowing to extract information from the data.

I - 1. CHARACTERIZATION OF PROFITS AND OF RELATED VARIABLES

I - 1.1 THE CHOICE OF VARIABLES

The fact that profits are one variable among many other aggregates makes it hard to choose the variables to which profits may be related. Virtually all schools of thought have addressed the issue of profits but those are generally of little help because they often represent schematized vision of reality, they typically rely upon a-priori knowledge and do not always make explicit all the variables involved.

A major challenge underlying the process of variable selection has its econometric counterpart known as the omitted variable case. Keynes [1939] for instance was highly skeptical of Tinbergen's early econometric work because Tinbergen did not make it clear on what basis he decided to include, or not include, the variables at play in his estimations. We now know that in the omitted variable case, the informational set is restricted and thus econometric inference is biased or even spurious because the results are assessed conditional on information restriction.

To overcome those major drawbacks we propose to analyze profits as stemming out of the definition as stated in the National Accounts. Corporate income, which we shall rename after 'profits' throughout the rest of the text, is reported in nominal terms in Table 1.12 in the latest (2003) NIPA revision, along with all other sources of income. Combining Table 1.12, 1.5.5 and Table 1.7.5 yields the accounting identity relating income-decomposition of national income to the demand-decomposition of the same aggregate. The income-spending identity features profits and fourteen related variables and is the following, with magnitudes as of the first quarter of 2005, in billions of current Dollars :

$$
\begin{aligned}
&\overset{8,538}{C} + \overset{2,084}{I} + \overset{2,259}{G} + \overset{1,249}{X} - \overset{1,940}{M} - \overset{1,405}{CFC} + \overset{31}{IncRoW} \\
&\equiv \underset{6,977}{W} + \underset{961}{PI} + \underset{1,345}{\Pi} + \underset{557}{NI} + \underset{834}{T_{YMS}} + \underset{155}{R} + \underset{83}{BTr} + \varepsilon
\end{aligned}
\qquad [1]
$$

where C stands for private consumption, I for private investment (residential, non-residential and changes in inventories), G for government spending (public consumption and public investment), X for exports, M for imports, CFC for consumption of fixed capital (private and public), $IncRoW$ for net income from the rest of the world, W for aggregate compensation, PI for proprietors' income, Π for corporate profits, NI for net interest, T_{YMS} for taxes on production and imports (less subsidies and surplus of government enterprises), R for rental income, BTr for business transfers, and ε for a statistical discrepancy[1]. For notational simplicity we shall refer to X_t as the set of all variables entering definition [1], except for the discrepancy.

Equation [1] is a definitional identity. It remains true every time the data is collected. Each variable can be thought either as a *direct* contributor to profits, or as an *indirect* one reflecting the influence of third-party variable(s). Imports for instance are not only the quantity of goods and services being brought into the United States ; to some extent they also reflect the state of the domestic economy and that of the trading partners, the exchange rate, duties, and so on. Because profits are defined in relation to imports, profits are affected by the same factors that affect imports. What is at the core of the present analysis is the study of the macroeconomic relationships among the variables of definition [1], with particular emphasis on the place and role of profits.

The interesting feature of such a departing point is that it avoids the pitfalls of model selection based upon theoretical considerations. Profits are here treated as one component of a large real world *system* relating income to spending –in a sense it is a hands on picture of the economy's complexity and interrelatedness. Yet, as anticipated, the picture gets much more complicated by such a model size inflation. Also, any timely analysis based upon [1] can only be a statistical analysis of *realized* profits (or any other variable of the model) yielding *ex post* results. Before proceeding to the study of the dynamic properties of such a system, a lot of knowledge is to be gained, as a pre-analysis exercise, from the statistical properties of (the logarithm of) each variable entering definition [1].

I - 1.2 DATA SOURCES AND PROPERTIES

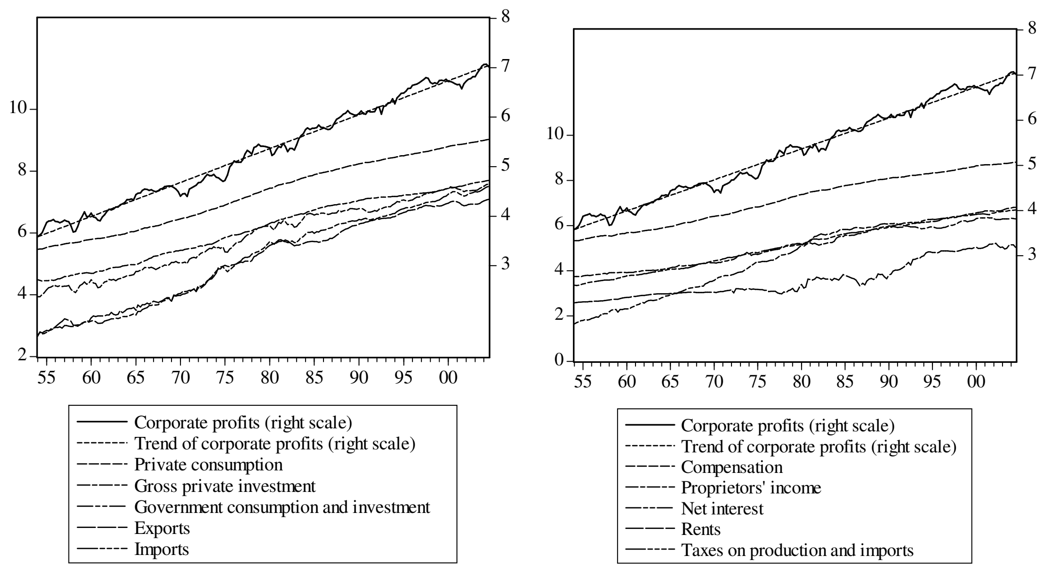
The data sources are the latest revision (2003) of the NIPA Tables 1.5.5, 1.7.5 and 1.12. All variables are reported in billions of current Dollars, all income variables are before tax, and are log-linearized. The data is available on a quarterly basis since 1947 but due to the accumulation of specific events –the Korean War, the treasury-Fed accord and the price control experience– we

[1] The discrepancy is negligible until the eighties, volatile but constant at around $+25 billions per quarter during the eighties and very volatile and erratic thereafter. Yet from 1994 to 2001, the magnitude ranges between +160 to -170 billions of current Dollars each quarter (between +2.3% and -1.8% of current GDP). The discrepancy is likely to be more attributable to misreporting or measurement issues on the income side, possibly for capital gains. We will leave this discrepancy aside of the present model because it is not directly interpretable and because it has a negligible magnitude most of the time. We encourage readers to refer to the NIPA website at for a presentation of the definitions of the variables involved.

choose to start our analysis at the later date of 1954q1. The final observation is 2004q3, so that 203 quarterly nominal observations per variable are used.

We first turn to the time plots of the variables. The following Figure 1 represents the amount of profits and its linear trend together with all *spending* variables on the left panel and all *income* variables on the right panel.

Figure 1 – Plots of corporate profits and related variables



Note : All variables in logs. All variables on the left scale except for profits and its time trend. The trend is obtained from a regression of corporate profits on time and a constant.

Two observations ought to be made from Figure 1. The first one is that of the smooth evolution of most variables, so that a more or less pronounced trend appears in retrospect. The exceptions here are trade variables and rents. The second point is that corporate profits appear as the most stable of all variables, apparently quite significantly reverting around its (simple) trend. The remarkable stability of corporate profits also holds when deflated by the GDP price level, so that profits clearly exhibit a one-of-a-kind behavior through time.

The stability of profits is indeed a puzzling result, rarely –if ever– mentioned in the economic literature. Yet the business literature provides disseminated ideas which may explain this stability ; one may think for instance about financial markets preference for smooth profits reports. This potential explanation is further reinforced by accounting techniques allowing firms to (temporarily) hide, convert or even transfer profit earnings. Yet it is impossible to know at the present stage the weight of such explanation ; we will take the stability of profits as a fact for the time being and will take that into account in the rest of the paper.

We then turn to the order of integration of the variables to inquire deeper into the question of trends ; as widely known this pre-test has important implications both for the theoretical and applied economists. For the purpose of the present study we recall that the key difference between processes integrated of order zero –or I(0)– and variables integrated of order one –or I(1)– lies at the level of the persistence of (exogenous) shocks, being transitory for the former and persistent for the latter. Stationary or I(0) variables are thus either trend- or mean-reverting : we reliably know that such variables have been at a bounded, zero-mean distance of their deterministic component at any time. To the contrary non-stationary variables such as I(1) variables have exhibited persistent deviations from their deterministic component : the process features a stochastic influence so that in the future, the distance from the deterministic part 'belongs to the unknown'. Indeed we know since the early eighties that most macroeconomic aggregates fall into the I(1) category, notwithstanding some controversies about the generality of this result when alternative methods, samples or parameters are used.

The classic way to discriminate between I(0) and I(1) variables is through testing for unit root(s). Yet those tests are subject to potentially severe limitations, especially since no universally most powerful test exists. Thus even though the presence of a unit root has clear theoretical implications, the empirical tests sometimes yields no clear-cut results besides a general consensus. To the extent any conclusion can reliably be drawn about the presence or absence of unit root(s), we chose to check for (non)stationarity on the basis of three unit roots with different spirits. Table 1 sums up the results of two unit root tests (the 'old' ADF and the 'newer' DFGLS) as well as the KPSS stationarity test.

First, the ADF test reports a significant trend in the deterministic specification for three series (profits, proprietors' inco me and investment) and does not appear irrelevant for six other series (rental income, business transfers, consumption, exports, consumption of fixed capital and income from the rest of the world). We are thus dealing with a set of variables featuring quite a somewhat significant trending pattern in log-levels, as anticipated from the time plots of the variables (detailed test results available upon request).

Yet are the series significantly reverting around such a deterministic trend ? Results presented in Table 1 indicate that this is not the case for any series except for the notable exception of corporate profits. All three unit root tests coincide unambiguously to corroborate our initial observation about the linear property of profits, and profits only.

Once the series are differenced, results of Table 1 unambiguously indicate that all series become highly stationary. Equivalently we find that shocks have had persistent effects on all series in log-levels except on profits for which shocks have proven to be merely transitory. This translates into profits having been always restored according to some trend, or equivalently that the various factors affecting profits have compensated through time, whatever profits would be related to.

Table 1 – Unit root and stationarity tests results on log and log-differenced series, 1954q1-2004q3

Variable and determ. Comp.		ADF test (1)		DFGLS test (2)		KPSS test (3)	
		log	Älog	log	Älog	log	Älog
C	T+C	0.74	0.64 [a] ***	-1.96	- 3.72***	0.250	0.416
	C	0.80	0.32 [a] ***	- 0.50	- 1.45	1.798	0.440**
I	T+C	0.41	0.00***	- 2.39	- 8.21***	0.262	0.042***
	C	0.80	0.00***	2.71	- 0.54	1.785	0.072***
G	T+C	0.86	0.00***	- 1.33	- 4.09***	0.302	0.264
	C	0.87	0.00***	1.40	- 3.23***	1.792	0.281***
X	T+C	0.80	0.00***	- 1.79	- 5.94***	0.251	0.092***
	C	0.71	0.00***	2.18	- 5.55***	1.784	0.180***
M	T+C	0.91	0.00***	- 1.13	- 3.58***	0.265	0.178**
	C	0.91	0.00***	4.29	- 3.53***	1.785	0.189***
CFC	T+C	0.80	0.14	- 1.61	- 2.02**	0.250	0.270
	C	0.86	0.04**	0.89	- 2.91***	1.790	0.291**
IncRoW	T+C	0.83	0.00***	- 1.25	- 7.98***	0.338	0.034***
	C	0.53	0.00***	1.14	- 4.37***	1.610	0.135***
W	T+C	0.99	0.00***	- 0.70	- 4.11***	0.305	0.357
	C	0.62	0.00***	0.71	- 3.98***	1.794	0.456**
PI	T+C	0.24	0.00***	- 1.23	- 12.38***	0.275	0.076***
	C	0.99	0.00***	4.88	- 9.63***	0.793	0.215***
Π	T+C	0.02**	0.00***	- 3.42**	- 3.33**	0.115***	0.021***
	C	0.88	0.00***	3.26	- 4.01***	1.794	0.021***
NI	T+C	0.99	0.00***	0.09	- 7.51***	0.389	0.190**
	C	0.07*	0.00***	1.13	- 5.72***	1.728	0.906
T_{YMS}	T+C	0.97	0.00***	- 1.00	- 5.83***	0.288	0.252
	C	0.73	0.00***	0.82	- 0.214 [a]	1.799	0.349**
R	T+C	0.74	0.00***	- 1.44	- 13.80***	0.359	0.075***
	C	0.96	0.00***	1.99	- 14.54***	1.620	0.165***
BTr	T+C	0.55	0.00***	- 2.28	- 5.48***	0.210**	0.057***
	C	0.68	0.00***	1.86	- 4.85***	1.786	0.146***

(1) ADF is the 1981 augmented Dickey & Fuller unit root test, computed with lag length based on the Hannan-Quinn criterion. The value reported is the significance level of the AR(1) t-statistic (with MacKinnon[1996] critical values).
(2) DFGLS unit root test is the detrended DF test by Elliott Rothenberg and Stock[1996], with the lag length as given by the Hannan-Quinn information criterion. The values reported here are the detrended residuals' unit root t-statistics, to be compared with the critical values tabulated by the authors of -3.46, -2.93, - 2.64 (in a model including a time trend) and -2.58, -1.94, -1.61 (in the case of a model including a constant only) at the 1%, 5% and 10% significance levels.
(3) KPSS test is performed with Newey-West bandwidth selection and a Bartlett kernel. Critical values at the 1%, 5% and 10% levels are 0.216, 0.146 and 0.119 in a model including a trend and 0.739, 0.463 and 0.347 in the absence of trend.

[a] : test uses a questionably low or high lag length. Results with other information criteria indicate stationarity at the 1% level

***,** and *** indicate (rejection of non-) stationarity at the 10%, 5% and 1% levels, respectively.**

The puzzling finding of profits' trend-stationarity reminds of Newbold, Leybourne & Wohar [2001]'s quote about real GNP : '*Faith in the hypothesis of trend-stationarity in RGNP over the period 1875–1993 would imply a belief that, at the beginning of time, God stretched out Her hand and drew a (straight) line in the sky, ordaining that henceforth (or at least from 1875) RGNP (measured in logarithms) would not wander arbitrarily far from that path*' (p. 97) . In the case of indeterminacy, the authors argue, it is better to treat processes as difference-stationary rather than trend-stationary because the former is a less restrictive assumption than the latter. For that reason and because we are working in a multivariate framework, we will assume that the whole system is I(1) or is accurately described by both a deterministic and a stochastic component.

Other interesting characteristics of the variables are their statistical properties summed up in Table 2.

Trade variables and net interest are the three series that present the highest average growth rate as well as the highest medians and belong to the highest standard deviations group. They are volatile and rapidly growing variables over the sample. The difference between investment and profits on the one hand, and consumption and compensation on the other hand does not lie at the level of the mean growth rate but at the level of volatility instead : *C* and *W* are much more volatile than I and Π. Finally government spending moves rather slowly and steadily, while rents is the slowest changing and the most volatile (especially after 1978) of all variables.

None of the distribution of the series can be said symmetric as measured by skewness except for net interest. Wages, corporate profits and investment especially report negative skewness, representative of the series having long left tails and indicative of below-mean persistence. The opposite holds for rents, who exhibit strong, positive skewness. All kurtosis values are above three which is a sign of excess peakedness. This is a minor in the case of wages, profits and government spending, but very high in the case, again, of rental income.

The measure proposed by Jarque & Bera combines the skewness and kurtosis statistics and is associated with a probability of a (non-) normal distribution. No series appears distributed normally except for government spending, wages, consumption and, to a lesser degree, corporate profits.

All in all the statistical properties of the data point towards a general lack of normality due to excess kurtosis, problem which is quite common in econometric analysis. Among all series under study, rental income comes out strikingly by reporting the lowest mean and variance along the highest skewness and kurtosis and by turning out especially non-normally distributed.

Table 2 – Descr. statistics of select log-differenced series, 1954q1-2004q3

	Mean	Median	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability
W	1,70%	1,71%	0,009	-0,22	3,31	2,37	0,31
PI	1,52%	1,41%	0,026	0,28	7,03	140,29	0,00
R	1,22%	0,72%	0,062	1,28	9,25	385,75	0,00
Π	1,72%	1,56%	0,053	-0,13	3,75	5,25	0,07
NI	2,31%	2,16%	0,032	0,03	4,61	21,98	0,00
C	1,76%	1,68%	0,008	0,30	3,03	3,13	0,21
I	1,78%	2,03%	0,047	-0,48	4,44	25,33	0,00
G	1,57%	1,49%	0,013	-0,11	3,27	1,02	0,60
X	2,15%	2,17%	0,042	0,31	5,54	57,88	0,00
M	2,34%	2,44%	0,039	0,26	5,47	53,93	0,00

Note : All variables considered in log quarter-to-quarter changes. Skewness measures the asymmetry of the distribution around the mean with value zero indicating perfect symmetry. Kurtosis indicative of peakedness/flatness of the distribution with value three similar to the normal distribution.

I - 2. INTRODUCING A DYNAMIC ECONOMETRIC METHODOLOGY

Equation [1] is disappointing on several respects because it is just an accounting identity. Even less profound is its inherent *static* nature which does not allow us to deal with the dynamics of the system (in the sense of causality, predominance or magnitude of impact). In addition the variables under study are income and spending variables and a general modeling strategy would be to allow for the possibility that variables depend and/or influence each other. We need a broad econometric model reflecting a dynamic version of an identity, pretty much in the spirit of King, Plosser, Stock & Watson [1991].

I - 2.1. THE RICH STRUCTURE OF ERROR-CORRECTION MODELS

A classic starting point for the study of economic relationships is that initiated by Sims[1980]. Sims's idea was that econometric models, primarily those used for forecasting, could 'not be taken seriously' because they were too often relying upon restrictive and arbitrary theoretical assumptions –among which the choice of variables and of causal directions are by no means exceptions. Sims therefore proposed vector autoregressions, or VARs, to discuss relationships in terms of the *dynamics* that prevail in an estimated *system*. Sims's goal was to build a general a-theoretical framework which would broaden the scope of analysis by relying on fewer assumptions.

Our preceding section showed that the variables we are dealing with are better understood as integrated processes over the sample. VAR models are not fully appropriate in that case because they may be subject to spurious results. On the other hand the historical record shows that our integrated processes are not unrelated to each other, and to the contrary appear to exhibit co-movements. Such co-movements are better not left out of the modeling process because they provide a richer inference basis[2]. Economically speaking those co-movements can be intuitively thought of as reflecting some (more or less fixed) proportionality between a set of variables, pretty much in the spirit of the 'great ratios' evidenced by Klein & Kosobud [1961] in the bivariate case. Econometrically speaking, the co-movements call upon the classic works of Granger[1981, 1983, 1987] on cointegration, i.e the idea that there exist common stochastic trend(s) which cancel out in the 'long run'. The present case therefore calls upon a richer, extended VAR model made to accommodate the case of cointegration.

The cointegrated VAR model has been extensively studied since the pioneering works of Johansen [1988, 1991] and Johansen & Juselius [1990]. It is also known as the error-correction model, or VEC, and is a generalization of Sims's original VAR model (with Gaussian errors) extended to account for possible cointegration. Following Johansen[1995], a most general representation of VECs is given by :

$$VEC(k): \quad \Delta X_t = \underbrace{\alpha.\beta'}_{\Pi}.X_{t-1} + \sum_{i=1}^{k-1} \Gamma.\Delta X_{t-i} + \mu_0 + \mu_1.t + \Phi D_t + \varepsilon_t^{ML} \qquad [2]$$

Representation [2] implies that each variable of X_t has its changes being explained by four different influences : a short-run part $\sum_{i=1}^{k-1} \Gamma.\Delta X_{t-i}$, a deterministic component $\mu_0 := \alpha.\beta_0 + \gamma_0$ (as a constant) and/or $\mu_1 := \alpha.\beta_1 + \gamma_1$ (as a trend) and a possible set of exogenous regressors D_t. The fourth and most original part is $\alpha\beta' X_{t-1}$, called the error-correction term –or ECT–, where α is a set of adjustment coefficients. The $\beta' X_{t-1}$ part is alternatively called 'long run relationship(s)', 'steady-state', 'common (stochastic) trend(s)' or more simply the cointegrating relationship(s). The number of such cointegrating relationships is being tested for through Johansen's Trace and Maximum Eigenvalue tests.

Because VECs are based upon a Gaussian VAR, both models feature much of the same properties and limitations. In VAR models as well as in VECs, each variable is being explained by the past values of all variables of the model, including its own. By stacking every such-explained variable in a coherent model, VARs and VECs model *simultaneous equation systems* where 'every single thing is allowed to depend upon everything'. As a consequence those

[2] Asymptotic inference would still be valid when applied to a VAR model consisting of *differenced* I(1) processes. Yet the estimates derived in that case are obtained from a restricted informational set (i.e. ignoring cointegration properties) which may affect all related inference. See Sims, Stock & Watson [1990] and Yamada & Toda [1998] for the implications in the typical case of Granger causality.

models do not embody *a priori* knowledge about whether a variable is a cause or a consequence and all variables are in turn treated as exogenous and endogenous. The fact that past values are included in the system also allows for lagged, dynamic effects to materialize and be taken into account, for instance through causality/precedence analysis.

The main difference between VARs and VECs is that the latter explicitly embody cointegration. By this extension VECs are given an additional channel of causality as reflected in the significance of the deviations from cointegrating relationships (see more below). VECs also make direct use of non-stationary time series, so that they expressly reflect the persistence of shocks –whereas shocks are restricted to be transitory in the typical VAR case. As a consequence a timely dichotomy between 'short run' and 'long run' emerges explicitly in VECs, therefore providing a richer and more general structure than VARs.

The limitations of the two models are almost the same. Both models are criticized for their lack of theoretical underpinnings and the high number of coefficients to be estimated which decreases the explanatory power. The estimation results of both models also suffer from high sensitivity to the parameters involved, which is further reinforced in the case of VECs because the number of cointegrating relationships is an additional parameter to estimate.

In the present state of econometric research, cointegration tests also suffer from several limitations. The Monte-Carlo simulations on Johansen's two cointegration tests point especially to well-specified (Gaussian) errors in the levels VAR and to a 'sufficient' lag length as important prerequisites towards efficient cointegration testing. A large number of observations (>100 obs. at least) is also required to avoid biases, so that unless appropriate adjustments are made, no inference can be made on the basis of VEC estimates for time periods lasting less than twenty-five years when quarterly observations are used.

Keeping in mind those limitations we proceed to the estimation of the fourteen-variable model.

I - 2.2. ESTIMATION OF THE PARAMETERS

The statistical groundwork being discussed, three steps are being followed to obtain confidently reliable estimates of the full system. Because of space requirements we do not supply the detailed tests results for parameters nor the fully estimated system. Following Sims [1980] we provide instead causality tests, variance decompositions and impulse/response functions as characteristics of the estimated system.

Choice of the lag length

How far back is the information contained in the data relevant ? An under-parameterized model would yield results based on a restricted model containing insufficient (past) information, and to the contrary an over-parameterized model would yield results based upon irrelevant past values and would decrease the explanatory power of the system. Thus one has to be careful about the choice of *k* since it has clear implications on the results –though not often mentioned.

Unfortunately, the usual criterions like the precision of the fitted model (FPE), the extra lag significance (LR sequential) test, or usual information criterions (AIC, BIC, HQ…) don't help set a value to *k* because they typically underestimate *k*, fail to whiten the errors and thus fail to provide Gaussian errors. A better way to choose *k* consists in checking normality, independence and homoscedasticity of the error terms sequentially in a specific-to-general manner.

Using Eviews, we have estimated the VAR in (log) levels, adding one lag at each step and checked for the Gaussian errors requirements. Multivariate normality has been checked with a Breush-Godfrey test with the Doornik-Hansen method. This test did not help us choose a lag length since all values of *k* provided normal errors. The independence of the errors has been tested for by an autocorrelation LM test up to 12 lags. It turned out that no major serial autocorrelation was present when *k*=2 or 7 or possibly 4 lags were used. The remaining heteroscedasticity assumption to fulfill is has been checked with a White test (no cross terms) for our three candidates *k*=2,4 and 7, resulting in seven lag specification as an overall better choice.

Deterministic component and tests for the number of cointegrating relationships

The next step is that of the test of the presence of common trends among the variables. This is done through the Johansen's cointegration tests, but those in turn rely upon the specification of a deterministic component among five possible choices. Those are, in the context of [2], from case five to case one : no restriction whatsoever on μ_0, μ_1, or $\gamma_1 = 0$, or $\mu_1 = 0$, or $\mu_1 = 0, \gamma_0 = 0$ but $\beta_0 \neq 0$, or $\mu_1 = 0, \mu_0 = 0$. Those cases are equivalent to say that the series in levels feature a significant quadratic trend (case five) a significant linear trend (cases four and three), or no significant trend at all (cases two and one). Note that all those cases are nested in one another, case five featuring no restriction at all but case four restricting the trend to lie in the cointegration space, and so on. Thus the choice of the deterministic component can be made on the basis of the significance of the extra deterministic component through an LM test (Johansen[1995]).

In the following we employed Johansen's Trace test as implemented in the JMulti software, version 4.02 (maximum eigenvalue test not implemented)[3]. Johansen's case five of a quadratic trend has *not* been tested for as it is not available in JMulti ; this probably has little implications on the basis that (1) case

[3] JMulti has several advantages over Eviews 5.1. JMulti provides most accurate critical values (response surface-based, stemming from a better random number generator), computes the critical values in the case of higher order models like ours (up to fifteen dimensions), and provides eight percentage points. Yet JMulti does not feature a maximum eigenvalue test, and Johansen's least-used cases one and five are not featured either. See www.jmulti.com for additional details.

five is known for yielding improbable out-of-sample forecasts, and (2) the data does not appear to follow a quadratic trend when taken in logarithms.

Case four yields eleven cointegrating relationships at the 1% level according to Johansen's Trace test. That specification features a linear trend in each cointegrating relationships, which all simultaneously turned out to be significant. This result corroborates the visual inspection of the series in (log) levels on Figure 1 which showed fourteen smoothly trending variables.

We are thus left with a fully-estimated VEC model with seven lags and a deterministic specification with a trend in the eleven cointegrating relationships only. The model explains (R^2) between 60% and 80% of the variance of all variables in $\Delta\log$s, but those figures drop to the 20%-60% range when degrees of freedom are being accounted for (adjusted R^2).

Stability and specification checks

We checked the robustness of the following results to alternative (*k*, *#CEs*, *deterministic specification*) combinations as those parameters may yield different results. It turned out that alternative numbers of cointegrating equations (on the basis of a relaxed significance level) did not change the general direction of our results. Additionally a lag exclusion test (Wald test) indicated that the lag length could never be reduced from k=7 without loss of information in any of the meaningful parameter combinations envisioned.

To avoid misleading inference we applied a battery of tests on the estimated VEC residuals. It has been first checked that they were Gaussian. Also, taken together, no specific event or time period making all residuals deviate could be identified. Finally the CuSum and CuSum of squares tests reject any strong evidence of structural or stochastic instability in (the intercept or in the error variance of) any equation. Yet this result is not very informative because it pertains to the post-1983Q1 era only –the tests of Brown, Durbin & Evans [1975] are based upon computations including the number of estimated parameters, which is high in the present case.

II. THE DYNAMICS OF THE MODEL

The model is now fully estimated and has passed the robustness checks so that we may now turn to the study of its dynamics quite confidently. We will convey this study along two lines : profits-specific causality, as well as system-wide causality to put our results into context. By concentrating upon profits we focus on the following equation :

$$\Delta \log \Pi_t = \sum_{i=1}^{11} \alpha_i ECT_{t-1} + \sum_{j=1}^{7} \Gamma_{1j}.\Delta \log W_{t-j} + ... + \sum_{z=1}^{7} \Gamma_{1z}.\Delta \log M_{t-z} + C + \varepsilon_{1t}^{ML} \qquad [3]$$

Equation [3] states that the growth rate of corporate profits is explained by the (seven past) growth rates of the each fourteen variables (including past values of the profits rate of growth), plus eleven error-correction terms or ECTs. Equation [3] contains 14*7+11=109 estimated coefficients, representing the influence of 14+11=25 distinct variables.

As often noted the concept of causality has different meanings which may or may not coincide with (economists') conventional views on the subject, and the same applies the concepts of exogeneity and endogeneity as well as to the short/long run dichotomy. For those reasons we will precisely define several econometric concepts before discussing the results. In the three sections below we should in turn distinguish between *temporal* '*short run*' *causality* (§II.1), *variance* '*long run*' *causality* (§II.2) and '*impact causality*' (§II.3).

II - 1. EXOGENITY AND 'SHORT RUN' TEMPORAL CAUSALITY

As evidenced in equations [2] and [3] above, VEC models are dynamic models where every variable depends upon a set of lagged values of each and every variable in the model but also upon the immediately past disproportions (the ECTs). This distinction is proper to VEC models and gives rise to two concepts of causality : the usual Granger definition of causality and an additional causality channel through the ECTs.

II - 1.1. 'BUSINESS CYCLE' GRANGER CAUSALITY

A common concept of causality in a simultaneous equation model of the VEC type is that of Granger[1969]. In equation [3] above, Granger causality states that (say) imports *M* are 'causing' profits if the estimated Γ_{1z}'s are jointly significant. If this is not the case (i.e. $\Gamma_{1z}=0$ jointly), imports do no exert any influence over profits. Ultimately Granger causality tests the joint nullity of the estimated coefficients of the past values of each variable through a Wald test and results in a chi-square statistic and an associated significance level. A low (<5% or 10%, etc…) probability yields to the rejection of the basic hypothesis that the independent variable does *not* Granger-cause the dependant variable, so that non-causality between the two variables cannot be rejected. The joint significance levels may be used to deduct a Granger causal ordering, from the most leading to the most lagging variable (i.e. from the most exogenous to the most endogenous).

Causality in the Granger sense covers a specific definition of causality. First and as widely noticed, it is a precedence or predictability test. It thus helps determine the significance of the *direction* of causality (which may run each way), but does not provide any *weight* of the impact. Second, note the temporal nature of Granger's test, since the Γ_{1z} for instance are weights of lagged variables. Yet since the model features ECTs, Granger causality is only one side of the temporal causality coin. It measures only precedence when the ECTs have been accounted for, so that Granger causality is only indicative of precedence out of the 'steady states' or, we should say, during the business cycle. Third, since Granger causality deals with (the significance of) the weights of series which are required to be stationary (differenced in the present case), Granger causality runs from (multiple, lagged) *differenced* series to a single *differenced* series. The Granger causality test is therefore better understood as a test of 'short-run' significance-of-precedence during the business cycle.

Granger causality tests are here of particular interest with two respects : (1) Granger causality on the profit equation [3] will allow us to discriminate between variables that significantly precede the fluctuations of profits and variables that are not good predictors, and (2) Granger causality tests can be performed system-wide on all explained variables. This allows to put the results of (1) into perspective and to detect the (system-wide, dynamic) Granger causal chain.

(1) Which variables improve the forecast of profits in the 'short run' ?

The top panel of Table 3 features all Granger causality tests with each cell reporting the probability of Granger causality running from a row-variable to a column-variable. A bolded figure indicates significant Granger causality up to the 15% level.

The main result is that, during the business cycle, profits respond significantly to virtually all variables of the model. Some of them are better predictors than others : exports, imports and proprietors' income are excellent predictors of profits (p-value <1%), whereas private consumption, consumption of fixed capital, taxes on production and imports, and rents are good predictors (p-value<5%). Lower on the predicting power scale we find that government spending explains profits reasonably well (p-value=8%), while investment (p-value=13%) and compensation (p-value=16%) do the job somewhat loosely. Net interest, on the other hand, can be deemed a poor Granger-predictor of profits.

Results of Table 3 provide an unambiguous answer to the opposite question of 'what variables do profits Granger-cause ?'. The profits' line clearly indicates that profits do not Granger-cause any variable of the model at any reasonable significance level, except for consumption of fixed capital and proprietors' income (which itself consists of profits, though not of the corporate type). The present 'short run' precedence measure is thus evidence of Granger causality mostly running one way, from almost every single variable to profits.

Those points gives profits an adjusting variable role, having a very high degree of endogeneity and almost no leading role. Yet this degree has to be measured and be compared with the degree of endogeneity of the remaining variables of the system.

Table 3 – Results of 'Business cycle' Granger causality tests (from row to column, all series log-differenced)

↗	C_t	I_t	G_t	X_t	M_t	CFC_t	$Inc\ RoW_t$	W_t	PI_t	Π_t	NI_t	$T_{YMS,t}$	R_t	BTr_t
C	---	0,61	0,27	0,39	**0,03**	0,75	0,24	0,83	**0,05**	**0,04**	0,39	1,00	0,72	0,35
I	0,38	---	0,32	0,31	0,49	**0,02**	**0,16**	0,95	**0,00**	**0,13**	0,26	0,93	0,59	0,28
G	**0,11**	0,58	---	0,84	0,81	0,75	0,36	0,83	0,34	**0,08**	0,83	0,88	0,36	0,69
X	**0,03**	0,24	0,89	---	0,22	0,30	**0,09**	**0,07**	**0,02**	**0,00**	0,87	0,47	0,19	0,75
M	**0,03**	0,20	0,57	0,60	---	**0,15**	**0,13**	0,35	**0,01**	**0,01**	0,99	**0,08**	0,48	0,83
CFC	0,73	0,28	**0,01**	0,93	0,92	---	0,67	0,46	0,40	**0,03**	**0,12**	0,76	0,38	0,28
IncRoW	0,57	0,92	0,48	0,56	0,80	**0,00**	---	0,28	0,22	**0,01**	0,78	0,92	**0,03**	0,30
W	0,89	**0,10**	**0,14**	**0,05**	0,54	**0,05**	**0,03**	---	**0,01**	0,16	0,55	0,59	**0,04**	**0,01**
PI	0,48	**0,00**	0,71	0,75	0,47	0,26	0,49	**0,16**	---	**0,00**	0,47	**0,13**	**0,06**	0,48
Π	0,66	0,52	0,91	0,92	0,58	**0,12**	0,43	0,99	**0,00**	---	0,82	0,52	0,77	0,73
NI	0,21	**0,03**	**0,04**	0,69	0,75	**0,06**	0,58	**0,00**	0,67	0,45	---	**0,12**	0,94	**0,14**
T_{YMS}	0,47	0,48	0,28	0,34	0,94	0,25	**0,04**	0,27	0,20	**0,03**	0,28	---	**0,15**	0,63
R	0,67	**0,03**	0,70	0,60	0,61	0,19	0,62	0,18	0,61	**0,04**	0,93	0,73	---	**0,08**
BTr	0,25	0,92	0,63	**0,08**	0,99	**0,01**	**0,01**	0,24	**0,03**	0,84	**0,17**	**0,16**	**0,10**	---
ALL 'business cycle'	**0,05** 113,6 **[3]**	**0,00** 144,9 **[11]**	**0,01** 123,6 **[7]**	0,29 97,8 [2]	**0,11** 107,6 **[3]**	**0,00** 169,4 **[13]**	**0,00** 141,2 **[11]**	**0,08** 110,5 **[3]**	**0,00** 132,6 **[10]**	**0,00** 175,8 **[14]**	0,85 77,3 [1]	**0,01** 125,6 **[7]**	**0,08** 110,5 **[3]**	**0,01** 125,3 **[7]**
***F*-tests of joint ECTs**	**0.00** 2.94 **[6]**	**0.04** 1,98 **[3]**	**0.00** 4.12 **[11]**	**0.00** 3.59 **[9]**	**0.19** 1.38 [1]	**0.00** 3.16 **[7]**	**0.00** 3.07 **[7]**	**0.00** 2.68 **[5]**	**0.00** 3.75 **[9]**	**0.00** 5.19 **[14]**	**0.00** 4.82 **[13]**	**0.01** 2.50 **[4]**	**0.09** 1.68 **[2]**	**0.00** 4.26 **[11]**
JOINT Granger & *F*-tests	**0.00** 145.2 **[1]**	**0.00** 214.6 **[7]**	**0.00** 204.7 **[5]**	**0.00** 223.0 **[9]**	**0.00** 196.3 **[4]**	**0.00** 169.9 **[3]**	**0.00** 236.4 **[11]**	**0.00** 156.4 **[2]**	**0.00** 223.4 **[9]**	**0.00** 229.9 **[11]**	**0.00** 206.3 **[5]**	**0.00** 214.3 **[7]**	**0.00** 229.1 **[11]**	**0.00** 232.5 **[11]**

Notes : all statistics are p-values, except for the last three lines where the p-value is reported with the chi-square statistic and the [ordering].
Bolded figures indicate significance at the 15% level of causality from the row variable to the column variable.

Table 4 – Estimated alpha matrix (column variables are log-differenced)

	C_t	I_t	G_t	X_t	M_t	CFC_t	*Inc* RoW_t	W_t	PI_t	Π_t	NI_t	$T_{YMS,t}$	R_t	BTr_t
ECT_1	-0,132	**2,602**	0,508	0,377	-0,358	0,106	3,197	0,271	**1,499**	**4,775**	-0,435	-0,041	0,550	-0,367
ECT_2	**0,094**	0,049	0,071	0,151	**0,510**	-0,103	0,789	0,056	-0,067	**1,199**	0,192	-0,144	0,747	-0,464
ECT_3	0,103	-0,140	-0,093	0,035	0,604	-0,091	0,938	-0,007	**-0,709**	**1,102**	0,087	-0,093	0,521	-1,032
ECT_4	**0,067**	0,098	0,016	**-0,330**	0,193	-0,020	1,432	0,041	0,066	**0,763**	-0,019	-0,051	**0,723**	-0,338
ECT_5	-0,040	0,299	-0,073	-0,042	**-0,519**	0,024	**-1,862**	0,010	-0,031	-0,079	-0,087	0,059	**-0,736**	-0,192
ECT_6	0,010	**-0,654**	0,019	0,284	0,398	**-0,207**	0,866	-0,091	**-0,595**	**-0,981**	0,225	0,066	-0,675	-0,028
ECT_7	0,000	-0,024	0,012	0,004	-0,008	**0,023**	**-0,516**	-0,006	-0,005	**-0,064**	0,012	-0,011	0,039	0,056
ECT_8	-0,045	-1,449	**-0,499**	-0,815	-0,505	0,415	-2,532	-0,192	0,649	**-5,167**	0,107	0,201	0,562	1,796
ECT_9	-0,004	**-0,837**	0,006	0,197	0,273	0,062	0,103	**-0,074**	**-0,495**	**-1,174**	-0,018	-0,027	-0,033	**0,983**
ECT_{10}	-0,025	-0,139	-0,020	-0,027	-0,238	0,003	-0,088	-0,006	-0,030	**-0,808**	0,047	0,070	**-0,537**	0,500
ECT_{11}	-0,015	-0,175	**0,071**	0,059	-0,113	-0,023	0,808	0,004	**-0,123**	**-0,282**	-0,083	**0,075**	**-0,347**	**0,877**
LR test	45,44	29,92	56,42	44,79	**14,25**	43,89	43,53	41,99	48,25	70,88	21,79	33,57	30,84	63,31
of weak	0,00	0,00	0,00	0,00	**0,22**	0,00	0,00	0,00	0,00	0,00	0,03	0,00	0,00	0,00
exogeneity	[10]	[3]	[12]	[9]	**[1]**	[8]	[7]	[6]	[11]	[14]	[2]	[5]	[4]	[13]

Notes : bolded figures indicate significant coefficients at the 5% level. Likelihood ratio (LR) test is that of joint nullity of all ECTs for each column variable. The chi-square statistic, its associated probability and, into brackets, the weak exogeneity rankings are reported.

(2) What is the Granger 'short run' causal chain ?

This question can be assessed on the basis of similar Granger causality tests as featured in the 'ALL' line of Table 3. For each variable of the system, this line summarizes the joint causal level of all variables (other than itself) by reporting the p-value of the Wald test and the chi-square statistic. We also provide a ranking –or Granger-ordering– of those chi-square statistics, from [1] to [14], to cover the range of (non)causality running respectively from the most loosely caused variable to the most tightly caused variable. This ranking allows us to distinguish between four major groups of variables which are in turn presented below.

- *exogenous/independent/autonomous variables (rankings #1 and #2, p-values above 25%)*

[1, 2] : Net interest *NI* and exports *X* are the two most exogenous variables of the system with respective p-values of 0.85 and 0.29. Those values being above conventional levels, net interest and exports may be labeled 'exogenous in the short run' relatively to the remaining variables.

- *Least endogenous/dependent/non-autonomous variables (ranking #3, p-values between 5 and 11%) :*

[3] : Imports *M* and rents *R* immediately follow with lower conventionally acceptable p-values (0.11 and 0.08). Note that imports are Granger-caused only by consumption, moreover at a quite high significance level.
[3 *also*] : Compensation of employees *W* and consumption *C*. This ranking seems especially attributable to the influence of the above-mentioned handful of variables : compensation appears highly significantly predicted by exports and net interest. Consumption appears as driven by trade variables as well as by government spending to a lesser extent. An interesting point comes from the factors by which consumption is *not* influenced : any type of income. Obviously the autonomy of consumption is to be related to increasing indebtness.

- *endogenous variables (ranking #7, p-values of 1%) :*

[7] : government spending *G* and government collection of taxes on production and imports T_{YMS} appear to be in the middle of the Granger-ordering scale. Both variables are the results of policy choices to large extents. Note that T_{YMS} is found very sensitive to imports as one would have expected but, surprisingly, not sensitive to profits or to consumption.

- *Highly endogenous/dependent/non-autonomous variables (ranking #10+, p-values below 1%)*

[10, 11, 14] : Proprietor's income *PI*, investment *I* and corporate profits Π are the three least autonomous variables of all fourteen. Proprietors' income is found to heavily depend upon demand variables (except upon government spending), as well as compensation and profits (which are two subcategories of proprietors' income). Investment on the other hand, is not better predicted by *any* demand variable and appears to be much better predicted by the income side. Thus according to the present 'short run' measure, investment behaves very much in an exogenous/autonomous way, at least with respect to demand. Interestingly enough, investment is found non Granger-caused by profits and taxes on production and imports.

Note that except for imports and rents in the first group, all variables have their p-values below 0.11. This is indicative of a highly causal system, as expected from an income-spending model. This also reinforces the pertinence of our unrestricted approach, where 'everything is allowed to depend upon everything'. Yet even though we reached rankings of leading variables, this is not a deep result because almost all variables are of the same nature : endogenous. Thus Granger tests are interesting but need to be complemented by additional measures of causality.

II - 1.2. 'DISEQUILIBRIUM CAUSALITY'

Granger causality is not the only type of causality that takes place in the error-correction model. Deviations from the 'steady-states' open up additional channels of 'disequilibrium causality' which can be evaluated through the significance levels of the adjustment coefficients ($\hat{t}_{\alpha}$). As a result we report at the bottom of Table 3 the significance levels of all adjustment coefficients *jointly* by means of an *F*-test for each variable of the model. The individual significance levels (p-values of t-tests) of each error-correction terms are detailed in Table 4.

In general 'disequilibrium causality' results do not contradict the 'business cycle' causal chain evidenced above. Variables found in high (resp. low) rankings generally stay in high (resp. low) rankings : imports and rents for instance move from position [3] to [1] and [2], respectively, on the exogeneity scale. Imports especially stand up as the leading variable by this measure, with a p-value of 0.19, as compared with 0.09 for rents. All other variables are significantly caused by the set of past ECTs at the 5% level at least, which is another indication of the high degree of causality in the model.

The following exceptions ought to be noticed along general comments :

- Investment gains exogeneity by moving from place [11] to place [3]. Investment appears more responsive to *changes* in all variables during the business cycle than to past *level* mismatches. Yet investment remains mostly an endogenous variable given the joint ECTs significance level of 0.04.
- Net interest and exports move from one extreme to another. Previously ranked [1] and [2] and being exogenous, they are now ranked [13] and [9] respectively and turn out very endogenous. Those two variables are leading

factors during the business cycle only, and turn out very much influenced by the deviations from the 'steady-states'. This will be further inquired below.
- Compensation and consumption stay among the leading variables' group.
- Profits are still among the endogenous variables' group, being very significantly affected by the deviations from ten (out of eleven) cointegrating relationships.

II - 1.3. JOINT 'TEMPORAL, SHORT RUN' CAUSALITY RESULTS

Since temporal 'short run' causality may either originate from a 'business cycle' effect or a 'disequilibrium causality' effect, we ran tests reflecting the joint influence of both measures. This Wald test results in a statistic distributed as chi-square which is reported in the last 'joint' row of Table 3 for each variable of the system.

Results are that every variable turns out highly endogenous as evidenced by the significance levels which are all below the 1% level. This is another indication of the very high degree of causality that prevails in the system, up to the point where it is now impossible to clearly distinguish clearly between endogenous and exogenous variables. Yet as before, the present Wald tests yield chi square statistics which can be ranked so as to reflect a ranking of the variables' endogeneity. The main result of this joint test is that the present ranking does not contradict the two previous rankings : consumption and wages are clearly the least endogenous variables, followed by imports, government spending and net interest. A notable exception is rents which gain endogeneity by moving to the last ranking here, down from rankings [3] and [2] in 'business cycle' and 'disequilibrium' causality measures.

The main result of all three 'short run' causality tests is that the system we consider is highly causal. One may then derive exogeneity rankings that give consumption, compensation, imports, exports and possibly rents an especially important leading role. As an important property of the model, high levels of causality make it hazardous to discriminate among leading and lagging variables on the *sole* basis of the previous tests. Another measure of causality, with a different spirit, would provide a wider inference basis.

II - 2. 'LONG RUN CAUSALITY'

Just as 'short run' causality can be assessed on the basis of two measures (Granger 'business cycle' causality and 'disequilibrium causality'), two measures of 'long run' causality arise in the present context of a VEC model : weak exogeneity and FEVD 'variance causality'.

II - 2.1. WEAK EXOGENITY

A simple and interesting test to perform on the estimated system is that of weak exogeneity of each variable. A variable will be deemed 'weakly exogenous' when its adjustment coefficients cannot be taken as non-null. Economically speaking, the weak exogeneity property translates into the fact that the variable has influenced the 'long run' path of all the remaining variables of the system, while not being influenced by them. As such, a weakly exogenous describes a common driving trend of the whole system.

Johansen & Juselius [1990] describe in details the weak exogeneity LR test whose results for the present system are provided at the bottom of Table 4. The results unambiguously indicate that, at the conventional levels, imports *only* can be deemed weakly exogenous with respect to the 'long run'. This finding translates into the proposition that imports have acted in a very autonomous way and that, in the 'long run', imports have driven the system while the system has not significantly influenced imports in return. In particular, imports have influenced profits, but profits have left imports unaffected over the long run. This also means that a partial model, consisting of all variables but imports, could be analyzed *alone, conditional on imports*.

The finding of imports being weakly exogenous is not a surprise : we found imports as a major driving variable in the 'short run' in the previous sections. Also in the U.S. and on average for the last fifty years, imports have outpaced many variables including exports and GDP.

II - 2.2. FEVD 'VARIANCE CAUSALITY'

Another way to assess causality would be to complement our preceding 'short run' measures by 'long run' measures , which can be done using the decomposition of the forecast error variance, thereafter FEVD, following Masih & Masih[1997].

Just as temporal causality, FEVD describes a particular definition of causality. The idea behind FEVD is to simulate a shock on the fully-estimated system, realize a forecast up to some chosen horizon and then concentrate upon the variance of the forecast error. It can be shown that the FEV of each variable may be split into components attributable to each and every variable of the system, with all influences adding up to 100% at each time horizon. At any forecast horizon a variable will have its (forecast error) variance dominated by one or more variable of the system. As such FEVD is an indication of variable predominance. In addition, the more a particular variable has its (forecast error) being accounted for *by itself*, the least it depends upon other variables and therefore the more it is autonomous. This can be thought of as a degree of exogeneity or, equivalently, as a measure of the strength of the leading role.

Note at this stage that, contrary to Granger causality, the nature of causality implied by FEVD is not of the temporal sense because it relies upon the (forecast error) variance. FEVD is also an out-of-sample definition of causality since it relies upon forecasts. Because FEVD is most interesting if used to assess exogeneity/causality at far distant forecast horizons it has sometimes been used as a 'long run', out-of-sample exogeneity test.

Yet as widely known FEVD computations suffer from a major drawback. Because the estimated VAR/VEC errors (or innovations) are typically contemporaneously correlated, the impact of a simulated shock (on the error terms) is likely to incorporate the degree of correlation between the error terms. That case translates into the influence of a shock not being directly attributable to a precisely defined variable of the model. The Cholesky triangularisation of the error terms alleviates this problem by allowing to orthogonalize shocks. But in turn the orthogonalisation procedure yields results that are sensitive to the way the variables enter the system : the first variable in the model is allowed to affect all variables, whereas the second variable of the ordering chain affects all variables except for the first one, and so on. This is equivalent of imposing a shock hierarchy or ordering in order to make sense of the FEVD interpretation.

Unfortunately there is no universally better way to assess the prevalence of a hierarchical chain in any model so that one is left with the simulatation of 'typical shocks' (Sims [1980]). Those 'typical shocks' can be chosen on the basis of our previous section about temporal causality because the rankings arrived at reflect the predominance of variables. Highly ranked variables (e.g. [1]) are the most exogenous/autonomous variables and are thus variables most likely to lead rather than to lag the remaining variables, hence the most likely to act as causes rather than consequences.

In the following we have estimated six 'typical shocks' of a magnitude equal to one standard deviation. Three of them are based upon the precedence orderings evidenced in our results of 'business cycle' Granger causality (shock A), 'disequilibrium causality' (shock B) and 'joint short run' causality orderings (shock C). The three remaining shocks are simulated to check the robustness of our results when changes are made in the orderings (shocks D and E), and when the ordering is reversed (shock F is the converse of shock C).

Due to space limitations we do not provide all the details of the FEVD and report only the major results (the details are available upon request). We address the same issues as during Granger causality, this time with a 'longer run' perspective : (1) what affects profits in the longer run ? and (2) what are the most autonomous/driving variables of the whole system in the 'long run' ?'

(1) What affects profits in the long run?

We here concentrate upon the corporate profits equations and trace the FEV part attributable to each of the 14 variables of the system up to the ten years horizon (40 quarters). Table 5 summarizes the results at the 3-year horizon (12 quarters) and 8-year horizon (32 quarters, when the system seems at rest).

From the last two columns of Table 5 we learn that, whatever the ordering, profits do not account much for their own FEVD. The strongly decreasing FEVD profile over time means that profits are not autonomous, except mildly for the very few quarters following the shock. Profits again appear very much like an adjustment variable here again.

Cross-results in Table 5 also indicate that the forces affecting profits do not change much with the ordering. As a consensus, profits are mainly affected by consumption, imports and compensation at all times, with the additional influences of investment in the short run and of rents in the long run. The four most influential variables affecting profits in the long run typically account for over two-thirds of profits' FEV, so that only one third of profits' FEV remains to be attributable to the remaining ten variables of the system. Even in the unlikely case of a shock of type F hitting the economy do rents and compensation appear as primary factors affecting profits.

Table 5 – Most important variables of corporate profits FEVD

	at 12 quarters	**at 32 quarters**	**Percentage of profits' FEVD accounted for by own innovations…**	
			at *h* = 1	**at *h* = 8**
Ordering A	I, C, X, W	R, C, W, M *(65%)*	29.8	4.1
Ordering B	C, W, M, I	R, C, M, W *(68%)*	29.8	4.1
Ordering C	C, I, M, W	W, CFC, R, M *(65%)*	32.6	4.1
Ordering D	C, I, M, W	R, C, M, W *(67%)*	29.8	4.1
Ordering E	I, C, M, W	R, C, M, T_{YMS} *(69%)*	32.6	4.1
Ordering F	Π, W, C, M	I, R, W, PI *(51%)*	100	19.9

Note : *Italics* are the percentage of profits' FEVD being accounted for by the top 4 variables
A : 'business cycle' Granger causality ordering, **B :** 'disequilibium causality' ordering,
C : 'joint short run causality' ordering, **F :** Reverse of ordering D
D - Alternative temporal causality ordering :
M, W, C, R, T_{YMS}, NI, X, I, G, CFC, PI, IncRoW, BTr, Π
E - Alternative ordering (policy variables first, then labor and capital variables) :
M, R, T_{YMS}, NI, X, G, W, C, I, CFC, PI, Π, IncRow, BTr

(2) What are the driving variables of the system in the 'long run' ?

A similar analysis can be conducted on the FEV of each variable of the system and pay attention to each variable's degree of 'own variance sensitivity' . Table 6 present such an exogeneity measure up to the ten year horizon (or 40 quarters) for each variable of the model, according to the shock orderings A, C and F.

Table 6 – Percentage FEV attributable to each variable own innovations (variables in logs)

	C	***I***	***G***	***X***	***M***	***CFC***	***Inc RoW***	***W***	**PI**	**Π**	***NI***	***T_{YMS}***	***R***	***BTr***
Ordering A – Granger 'business cycle' causality ordering : NI, X, M, R, W, C, G, BTr, T_{YMS}, PI, IncRoW, I, CFC, Π														
1	78,7	47,3	84,1	99,8	63,2	71,5	92,4	81,1	71,9	29,8	**100,0**	73,3	96,8	89,7
4	48,6	22,3	59,0	80,0	45,4	33,1	54,8	58,0	35,8	12,2	**91,5**	64,8	78,2	67,5
8	33,7	20,3	33,4	60,7	37,9	12,8	42,5	32,4	18,1	5,9	**67,3**	43,5	66,2	42,8
16	20,3	20,6	7,2	22,5	33,7	4,5	26,8	10,9	11,3	3,7	23,8	29,7	**56,8**	20,7
24	17,8	14,2	3,1	10,2	30,8	5,7	11,7	4,4	7,2	1,8	6,4	19,9	**58,3**	11,8
32	16,7	10,1	2,3	4,8	24,9	6,9	5,9	2,1	4,2	1,6	2,3	9,2	**59,7**	8,3
40	16,9	6,7	1,5	3,2	20,2	7,1	4,1	1,7	3,6	2,4	1,4	4,4	**61,5**	5,5
Ordering C - Joint ' short run' causality ordering : C, W, CFC, M, G, NI, T_{YMS}, I, X, PI, R, Π, BTr, IncRoW														
1	**100,0**	50,1	92,5	62,4	79,4	99,1	80,0	81,4	73,7	32,6	93,6	73,7	72,1	81,7
4	76,4	23,4	67,0	38,3	34,7	49,4	45,3	54,7	32,9	14,3	**87,5**	62,6	50,8	64,5
8	55,5	21,6	41,4	23,5	24,5	27,1	36,6	30,4	16,6	6,8	**62,4**	40,1	33,9	42,1
16	**40,6**	18,0	9,8	7,4	18,8	20,8	23,5	11,9	10,1	3,4	20,6	27,7	24,6	20,7
24	**34,4**	11,8	5,4	2,8	18,1	24,2	10,6	5,0	6,1	2,5	6,9	19,6	23,4	10,9
32	**27,5**	8,1	4,8	1,4	14,2	**27,4**	5,6	3,4	4,3	3,1	3,6	9,9	25,1	7,7
40	22,3	5,3	4,2	1,0	11,1	**28,6**	4,0	5,3	4,4	4,3	2,3	4,6	27,2	5,0
Ordering F – 'Profits first' ordering : Π, BTr, IncRoW, PI, CFC, G, I, X, NI, T_{YMS} , R, C, W, M														
1	53,5	66,3	94,6	77,0	40,0	82,8	90,4	41,4	99,5	**100,0**	87,4	74,8	70,1	98,8
4	36,0	39,1	75,5	59,9	18,5	45,3	56,8	19,3	61,0	58,9	**80,0**	67,1	48,9	79,1
8	24,6	28,1	50,3	45,9	14,3	30,9	45,5	8,6	33,2	32,4	**57,8**	44,1	31,7	52,0
16	18,9	23,1	13,3	16,5	12,6	27,6	**31,6**	3,1	21,6	14,9	18,8	**30,8**	22,1	26,1
24	16,4	14,7	8,8	7,2	12,5	**30,1**	17,3	3,0	13,4	7,2	6,2	23,7	19,9	14,7
32	13,7	9,1	8,6	3,4	10,4	**32,0**	11,5	3,3	7,5	4,8	2,5	13,7	20,3	10,3
40	11,7	8,1	7,4	2,4	8,9	**31,8**	9,6	2,8	6,7	3,9	1,1	7,2	21,7	7,2

Results of Table 6 indicate that net interest *NI* and exports *X* are noticeable factors until only 16 quarters or four years after the simulated shock has been simulated. In the longer run consumption *C*, rents *R*, and imports *M* (as well as consumption of fixed capital *CFC*) take the leading roles in the system. Another interesting result is that profits turn out very much endogenous again by the present system-wide FEVD measure. Moreover this finding appears ordering robust : even with ordering F placing profits as affecting all variables of the system, the profits' own FEV starts at 100% but decreases ex ponentially so that profits' degree of exogeneity is only 15% at 16 quarters (less than 4% with orderings A or C).

It broadly appears that the exogenous variables evidenced previously according to the temporal, 'short run' approach to causality still exert powerful influences in the longer run by this FEVD measure. Only compensation, previously found to have a strong influence at the profit-specific level, is no longer an important factor at the system-wide level.

II - 3. IMPULSE/RESPONSE FUNCTIONS OR 'IMPACT CAUSALITY'

We have so far discussed temporal and FEVD concepts of causality which have allowed to identify the direction and strength of causality in the 'short run' and the 'long run'. Yet such results do not allow measuring by how much a variable will change. Following Sims[1980] the signs and magnitudes can be assessed through the computation of impulse-response functions or IRFs. In the present context of a system, those responses can be interpreted as dynamic multipliers because they take into account the lag structure of the model and its feedback properties.

The idea behind IRFs is again to simulate a one-time shock on the system and then keep track of the effect of a response variable when a change or impulse is simulated on another variable. For the very same reasons given during FEVD analysis, one needs to orthogonalize the innovations in order to make sense of the interpretation of the results, e.g. through the Cholesky decomposition. That translates into different assumptions made as of the causal properties of the system so that different orderings *may* give rise in different IRF values. On the other hand Pesaran & Shin[1998] present a 'generalized impulses' method for computing IRFs that does not require orthogonalisation and is ordering-invariant. As a result we provide IRF results with three different Cholesky orderings as well as under the 'generalized impulses' approach.

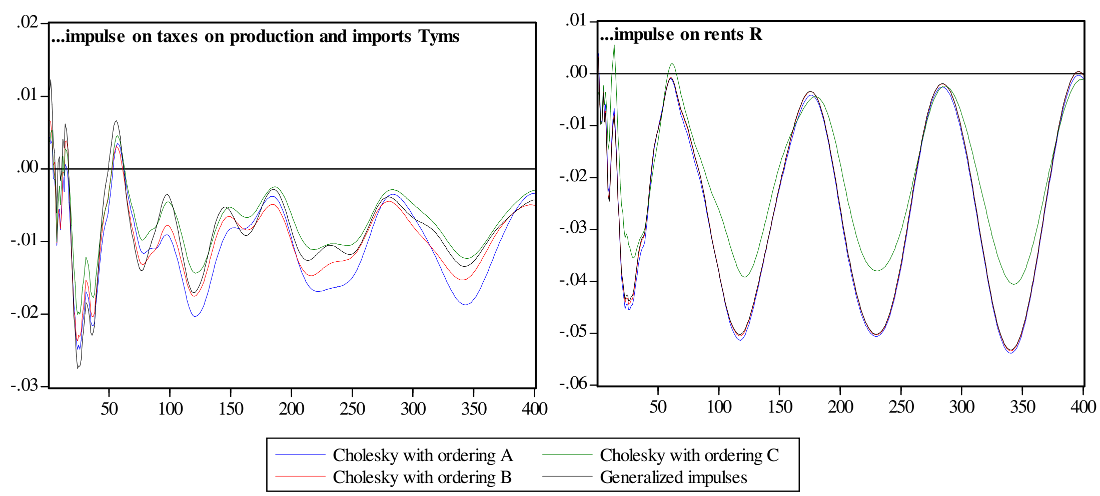
We simulate a one-time shock on the system by increasing every variable by an arbitrary amount (a unit standard deviation), and then keep track of the evolution of corporate profits as time elapses after the shock. Please note that any IRF value represents a 'spot' value, and that in order to assess the overall effect of a shock at horizon *h*, on has to accumulate all the dynamic multipliers before quarter *h* (accumulations not reported here). Note also that the results assume no other shock takes place, so that IRFs are better understood as a 'thought of experiment'. The following Figure 2 presents the responses of profits for ten variables which have proved so far to be interesting by some measure.

As anticipated, the time profiles of the IRFs varies with the computational method employed ; yet the results are not too conflicting in themselves.

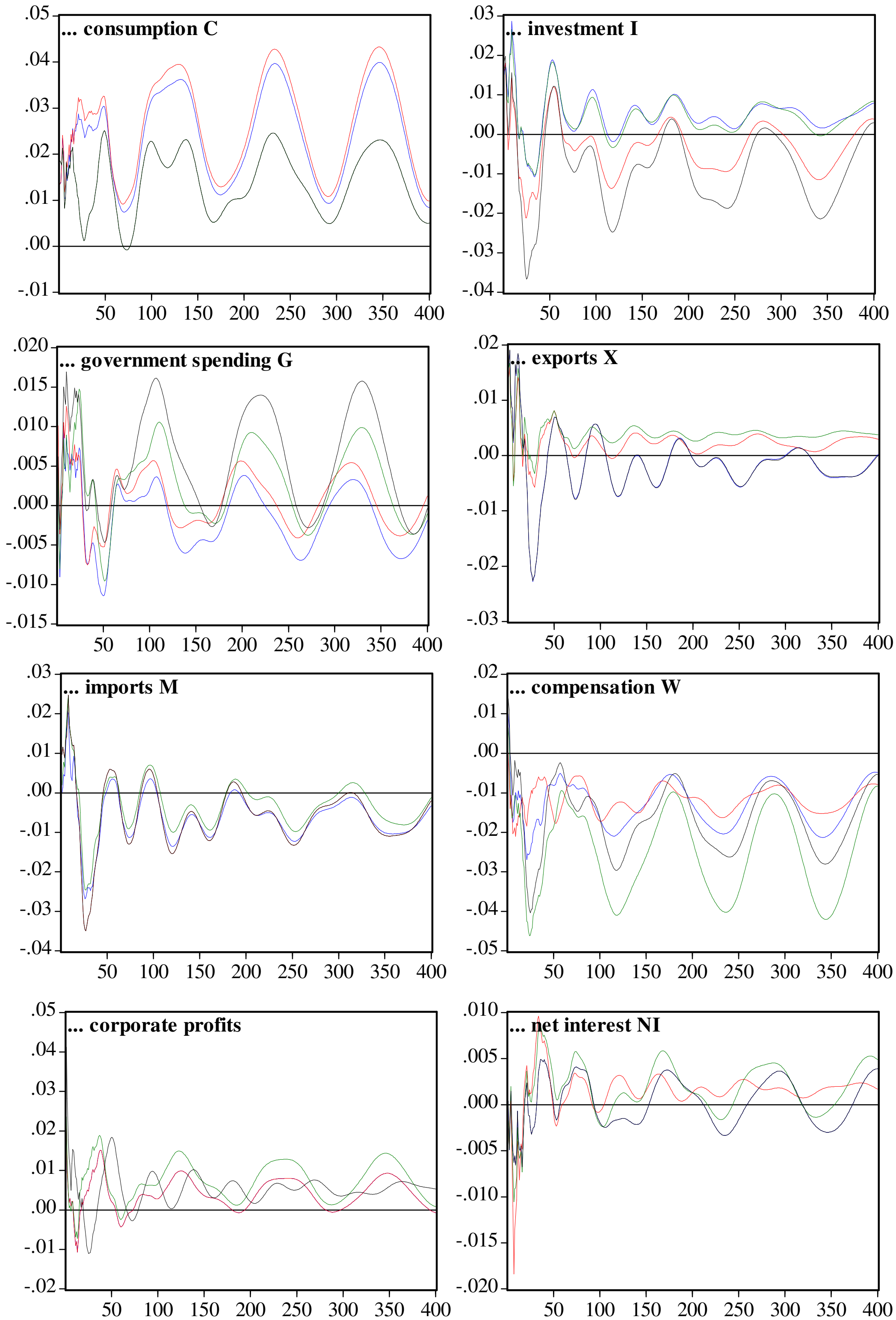
Consensus results are the following :

- increases in consumption *C* have the largest positive impact on profits,
- there appears to be overshooting in *G*, *X*, *M*, T_{YMS} and *I*
- *G* and *X* appear to be relatively neutral on profits,
- increases of Imports *M* and especially T_{YMS} have a negative effect over profits,
- Net interest *NI* has a negative effect on profits in the very short run, and no effect in the longer run,
- Profits do have a positive effect on themselves,
- Investment *I* has a positive effect on profits in the very short run, then overshoots but the results are not clear in the long run : IRFs with Cholesky orderings A and C detect a positive influence of investment on profits, whereas the effect is negative when using Generalized Impulses or Cholesky ordering B.
- Wages *W* have a clear negative effect on profits
- increases in rental income *R* have the largest negative impact.

Figure 2– Responses of corporate profits to an impulse on…



Note : The observed oscillations of the IRFs are purely due to complex roots in the system and are due to the parameters involved.



... consumption C
... investment I
... government spending G
... exports X
... imports M
... compensation W
... corporate profits
... net interest NI

III. A REASSESSMENT AND POLICY IMPLICATIONS

We have now reached the point at which to gather our numerous results and make sense of an intuitive explanation. Besides weak exogeneity we reached essentially four exogeneity rankings : system-wide rankings (in the short and long run), and profit-specific rankings (in the short and long run also). Those are summed up in Table 7 :

Table 7 : Most causal variables

	System-wide	**Profit-specific**
'Short run business cycles' (Granger causality)	NI, X, M, R, W, C, G, T_{YMS} …	PI, X, M, CFC, T_{YMS}, C, R, G…
'long run FEVD causality'	R, M, C, …	R, C, W, M, … **or** W, CFC, R, M, C, …
Weak Exogenity	M	

First a striking result appears. The same set of three variables appears in all rankings : rents *R*, imports *M* and consumption *C*. This is true whether in the 'long run' or 'short run business cycle', whether for profits in particula r or for the system as a whole. Equivalently this result implies that rents, imports and consumption are the most powerful forces underlying profits' behavior as well as dominating the whole income-spending system. Rents, imports and consumption are excellent predictors of the short run movements of profits and, over the long run, those three variables are also accounting for most of profits' variance. Those results corroborate the Profit Paradox intuition according to which 'in the long run, you are still in short run' and contradict the theoretical dual temporal nature of the economy as assumed in the New Consensus theory.

Second, the system-wide results indicate that profits, far to be a cause, are better described as consequence. In the short run, profits are driven by the changes in (nearly all) other variables. Almost all variables evolve before profits in the short run. As such this result does not contradict the New Consensus theory which acknowledges that the economy, and profits in particular, may be subject to demand disturbances in the short run. Yet most variables loose their influence over the longer run. Besides rents, imports and consumption, Table 7 reports a large influence of compensation over profits, but in the long run only.

A third result emerges from Table 7 in the short run case. This is about government spending *G* and taxes on production and imports T_{YMS}, who both appear middle ranked at the system and profits level. Thus besides rents, imports and consumption lie the *weaker* influences of government spending and taxes on production and imports. This appears as a mostly short run result, as G and T_{YMS} do not show up as driving factors in the long run either for profits or for the whole system.

From this point on, two concluding lines emerge as to how to interpret this set of leading factors. The first one answers the initial question of 'what drives American profits ?', while the second one digs deeper into the nature of the variables involved. The following sections 3 and 4 deal with the relationships between profits and investment on one hand, and between consumption and compensation on the other hand.

III - 1. WHAT DRIVES AMERICAN PROFITS THEN ?

Our numerous results point to the following five key points :

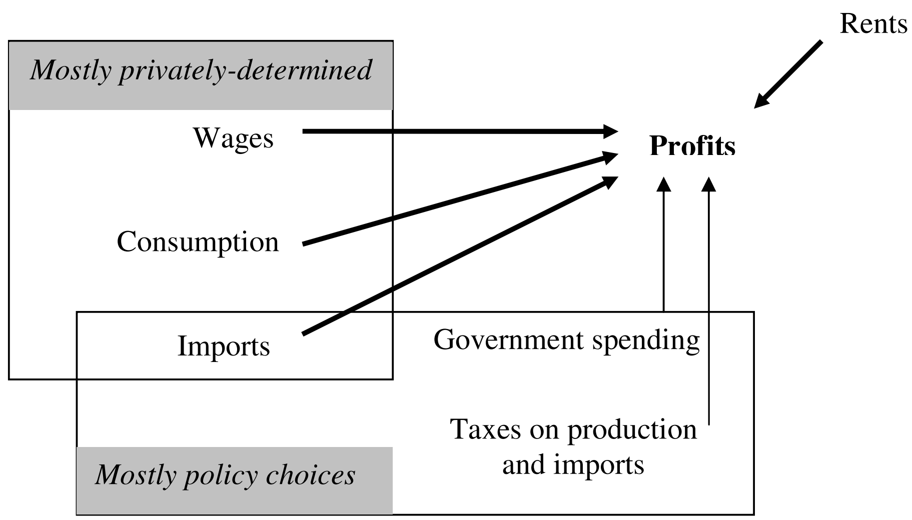
- Of paramount importance lie the changes in rental income, imports and consumption. All three variables are highly causal of profits both in the short and the long run. Rents have the largest influence over profits and this influence is negative. Imports have a measured negative impact on profits. Increases in consumption are the most important positive factor affecting profits.
- Government spending and tax recollection on production and imports are important factors affecting profits, and the causal link is mostly a short run phenomenon. Taxes on production and imports reduce profits, but it is hard to measure the impact of government spending. It seems that government spending has a neutral to somewhat important positive impact on profits.
- Aggregate compensation drives profits in the long run only, and has a relatively large and negative influence over them.
- Profits also react quite importantly to other factors in the short run. Quite worth noting is the influence of exports which are very predictive of profits and have a fairly positive impact in the short run.
- Other important factors do not appear related to profits either in the short run or the long run ; those are investment and net interest. While not causal, both variables influence profits quantitatively. An increase in net interest has a negative impact on profits in the short run, and relatively neutral thereafter. Investment has a positive impact on profits in the short run, but after overshooting the results about the magnitude and sign of the impact are conflicting.

III - 2. NATURE OF THE VARIABLES AND POLICY IMPLICATIONS

An interesting property of the previous results is that the most important factors can be classified in two groups. Profits then appear driven by a first group of variables being mostly privately-determined, and profits appear driven by a second group of variables mostly being the result of policy choices.

- The 'mostly privately-determined' group of variables affecting profits consists of consumption and compensation,
- The 'mostly policy-determined' group consists of government spending and taxes on production and imports (through the budget).
- Imports belong to both groups, because nearly half of American consumption consists of imports, and because imports are influenced by the exchange rate.
- Exports and proprietors' income are two exceptions to this classification, but they were showed to affect profits merely in the short run.

This classification is interesting in many respects ; yet it misses two important points : (1) the category, if any, in which rents fall is uncertain, and (2) monetary policy as evidenced through the interest rate channel, is absent. It is indeed not clear on which variable(s) the interest rate, which is not explicit in the present model, has a significant influence.



III - 3. PROFITS AND INVESTMENT : FEATURES AND RELATIONSHIPS

A striking result from our estimated model is the relationship between profits and investment. Profits are found highly endogenous whereas investment is more exogenous according to all measures of exogeneity. Further, investment comes out very exogenous in the short run and endogenous in the long run, according to our FEVD measures. Because of those properties, and because of general theoretical considerations, it would have made sense to have found profits reacting to changes in investment. Yet this is not the case generally speaking.

The results from Granger 'business cycles' causality indicate that investment spending is only a very loose predictor of profits in the short run (p-value of 0.13). The converse is not true : profits are clearly not a good predictor of investment in the Granger sense (p-value of 0.52). Thus the causality appears to run one-way only, from investment to profits ; yet this is not a strong causal incidence.

This finding extends to the long run case where profits are found to depend very little on investment :

- From zero to four years after a typical shock occurs, FEVD (with Granger or joint short run ordering) attributes between 13%-23% of the variance of profits to the investment factor. This is not much, but investment comes about the second most important factor, only slightly behind consumption.
- From 24 quarters or six years, the share of the variance of profits explained by investment decreases and always remains below 5%, so that investment cannot be deemed an important factor determining profits in the long run.
- Conversely investment does not appear to depend at all upon profits. FEVD results indicate that, whatever the ordering assumed and whatever the time horizon considered, profits typically account for less than 1% of the variance of investment.
- What appears to drive investment, still following its FEVD, are past investment spending (which is a measure of investment exogeneity), imports and wages in the short run. In the longer run, rents are especially important, followed by consumption. In the longer run investment looses much of its short run exogeneity.

All in all the picture is the following : investment and profits are quite remote from each other ; investment is exogenous in the short run, which is compatible with Keynes's animal spirits. Investment therefore does not appear to influence much of profits' behavior, except for a small, positive, influence in the short run.

III - 4. ON THE CONSUMPTION SECTOR

Another important result of the present study is the paramount leading role of the 'consumption sector', consisting of private consumption, aggregate compensation and imports. As mentioned earlier this set of variables can be viewed as privately-determined to a large extent. Yet besides the definitional homogeneity lie profound differences. The first difference is quite obvious and lies at the level of the nature of the variables : consumption and imports are spending variables, whereas compensation is an income. The second difference is more profound and lies at the level of the relationships between the three variables ; those can be evidenced through the previous causality tests :

- According to Granger 'short run' causality tests, aggregate compensation is not a good predictor of either consumption or imports, with respective p-values of 0.89 and 0.54. That means that consumption spending (imports included) is quite autonomous, at least from compensation. By the same measure, compensation is found not to depend upon either imports or consumption (p-values of 0.35 and 0.83, respectively). Equivalently compensation is found very exogenous, or autonomous, with respect to consumption and imports.

- The FEVD of consumption indicates that consumption is much of an autonomous decision, pretty much like investment is autonomous, but more strongly so. By this FEVD measure consumption is found to mainly depend on itself in the short run (typically for three years), and thereafter the main factors accounting for the variance of consumption are rents and consumption itself. In any way compensation does *not* account for more than 10% of the variance of consumption at any time horizon.
- The FEVD of imports resembles much that of consumption. Imports are found autonomous, but only in the very short run (typically for a year), and then depend much upon private consumption and, surprisingly, rents. As on consumption, compensation is found to have a very limited effect on imports, since compensation accounts for less than 15% of the variance of imports in the short run and typically less than 2% in the longer run.
- The FEVD of compensation is also quite similar to that of consumption and imports. Compensation is found to be very exogenous in the short run (typically four years), depending mostly upon its won past values. In the longer run the autonomous natures fades quickly away so that most of the variance of compensation is attributable to rents and consumption, especially.

The main teaching of such results is as follows : R, C and M are very much autonomous and therefore independent of each other in the short run. In particular we do not find evidence of any strong importance of compensation in the explanation of consumption and imports, either in the short or the long run. That means that the American economy is much better understood as having a large consumption sector that is autonomous with respect to the main source of income : compensation. The only explicit income variable affecting consumption and imports are rents, and this only appears as a long run phenomenon.

This of course brings one to the issue of financing the consumption decisions. Since income (compensation) does not account for much of spending, the amounts spent on consumption and imports has to come from elsewhere, typically from borrowed money or savings. As such we find evidence that the two quintessential properties of the American economy, especially since the eighties, of increasing (net) indebtness and falling household saving rate have been of paramount importance. Those two factors have allowed for a high growth of the consumption sector *beyond* the possibilities of traditional consumption financing from labor income.

This may also be interpretable in a causal way, from indebtness to sustained growth, even though the financing options of households do not appear as explicit variables in the present model. Yet the present explanation remains strongly compatible with the facts ; it matches the observed increase of indebtness and falling personal saving rate, it matches a strong growth in the consumption sector and the corresponding widening trade deficit, and it matches our finding that the consumption sector has led the American economy.

Concluding directions

The present paper has attempted to provide an answer to the question of what drives profits from a most empirical perspective. Profits are indeed one of the most central focal point of economists, partly on a theoretical ground, and –we have shown- partly because they are the most stable aggregate in the last fifty years. This finding alone should deserve much attention but is beyond the scope of the present inquiry.

Some data and technical limitations persist beyond our continuous attention on the robustness of the results. As such it is more careful to understand the present findings as schematized results emerging from a variety of coherent sources and computations. In particular, it may be that our results are more relevant to the latest part of the sample, say from the eighties onwards.

In the course of the paper two major strands of results have emerged : those related to the income-spending system as a whole, and those pertaining to profits in particular. Yet that distinction has not proven to be very deep because the same variables dominate profits and the system as a whole. More specifically (and besides short run specific factors), two sets of factors have driven profits and the whole system : the mostly privately-determined consumption sector at large (consumption, imports and compensation), and the mostly policy-determined sector (imports again, government spending and taxes on production and imports). Additionally we find that rents exert a very powerful negative influence over almost any variable of the model, especially in the long run.

We find profits being highly endogenous, i.e. far to behave in an autonomous way, profits are better thought of as being the result of the changes in the other variables of the system. Nearly all variables affect profits in the short run, but only rents, imports, compensation and consumption remain decisive in the long run. All of these variables are especially autonomous, at least in the short run (as is investment). Government spending and taxes on production and imports also affect profits quite significantly, but only so in the short run.

Among these qualitative central variables stands especially consumption (and government spending to a lesser extent), as having the most important quantitative *positive* impact on profits. Rents, compensation and imports, in that order, are found to be the two most important drags of profits.

As a conclusion emerges the prevalence of the consumption sector as the most important driving force underlying the American economy and American profits. This is being corroborated by the observed facts of increasing indebtness, falling saving rates and deepening trade deficits, and our result of a greatly disconnected relationship between consumption at large and compensation. It is clear that this kind of financing cannot go on forever ; saving is now very low, and indebtness will eventually have to slow down. Should the American consumption pace slow, imports would fall and thereby create conditions of slower growth in the rest of the world.

Yet as we have evidenced the policy factors are not neutral with respect to the fate of the American or World economies. In that sense, the unsoundly-financed American consumption growth may need to be effectively counter-balanced by the future economic policies. In that field the present inquiry also sheds new light on the theoretical debate opposing New Consensus and Profit Paradox views. Our results indeed clearly provide greater support to the latter and substantially challenge a successful long run perspective for New Consensus policy making.

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Appendix 1 – NIPA definitions

The 'guide to the NIPAs' available on the BEA's website presents NIPA definitions of the different aggregates used in this study. It reads as follows :

C : Personal Consumption Expenditures (PCE) are goods and services purchased by U.S. residents. PCE consists mainly of purchases of new goods and of services by individuals from private business. In addition, PCE includes purchases of new goods and of services by nonprofit institutions (including compensation of employees), net purchases of used goods by individuals and nonprofit institutions, and purchases abroad of goods and services by U.S. residents. PCE also includes purchases of certain goods and services provided by general government and government enterprises, such as tuition payments for higher education, charges for medical care, and charges for water and other sanitary services. Finally, PCE includes imputed purchases that keep PCE invariant to changes in the way that certain activities are carried out—for example, whether housing is rented or owned, whether financial services are explicitly charged, or whether employees are paid in cash or in kind.

I : Gross Private Domestic Investment (GPDI) consists of *fixed investment* and *change in private inventories*. Fixed investment consists of both *nonresidential* fixed investment and *residential* fixed investment. It is measured without a deduction for CFC and includes replacements and additions to the capital stock. It covers all investment in fixed assets by private businesses and by nonprofit institutions in the United States, regardless of whether the fixed asset is owned by U.S. residents. (Purchases of the same types of equipment, software, and structures by government agencies are included in government gross investment.) It excludes investment by U.S. residents in other countries. *Nonresidential fixed investment* consists of both *structures* and *equipment and software.*
Nonresidential structures consists of new construction (including own-account production), improvements to existing structures, expenditures on new nonresidential mobile structures, brokers' commissions on sales of structures, and net purchases of used structures by private business and by nonprofit institutions from government agencies New construction includes hotels and motels and mining exploration, shafts, and wells. Nonresidential structures also include equipment considered to be an integral part of a structure, such as plumbing, heating, and electrical systems. *Equipment and software* consists of purchases by private business and by nonprofit institutions on capital account of new machinery, equipment, furniture, vehicles, and computer software; dealers' margins on sales of used equipment to business and to nonprofit institutions; and net purchases of used equipment from government agencies, from persons, and from the rest of the world. Own-account production of computer software is also

included. For equipment that is purchased for both business and personal use (for example, motor vehicles), the personal-use portion is included in PCE.
Residential fixed investment consists of all private residential structures and of residential equipment that is owned by landlords and rented to tenants. Residential structures consists of new construction of permanent-site single-family and multifamily units, improvements (additions, alterations, and major structural replacements) to housing units, expenditures on manufactured homes, brokers' commissions on the sale of residential property, and net purchases of used structures from government agencies. Residential structures include some types of equipment that are built into the structure, such as eating and air-conditioning equipment.
Change in private inventories is the change in the physical volume of inventories owned by private business, valued in average prices of the period. It differs from the change in the book value of inventories reported by most business; the difference is the *inventory valuation adjustment*.

X_{net} : Net Exports of Goods and Services. is *exports* less *imports* of goods and services. Income receipts and payments and transfer payments to the rest of the world (net) are excluded.

G : **Government consumption expenditures and gross investment**, the measure of government-sector final demand, consists of two major components: *Current consumption expenditures* by general government, and *gross investment* by both general government and government enterprises. *Consumption expenditures* consists of compensation of general government employees (except own-account investment), consumption of general government fixed capital, and net current purchases from business and from the rest of the world. Consumption expenditures also include changes in inventories and net purchases of used goods. Current receipts for certain goods and services provided by general government agencies—primarily tuition payments for higher education and charges for medical care—are defined as government sales, which are treated as deductions from government consumption expenditures. Gross investment consists of purchases of new structures and of equipment and software by both general government and government enterprises, net purchases of used structures and equipment, and own-account production of structures and of software. Government consumption expenditures and gross investment does not include current transactions of government enterprises, transfer payments, interest paid or received by government, subsidies, or transactions in financial assets and nonproduced assets such as land.

W : Compensation of employees is the income accruing to employees as remuneration for their work. It is the sum of wage and salary accruals and of supplements to wages and salaries.

Wage and salary accruals consists of the monetary remuneration of employees, including the compensation of corporate officers; commissions, tips, and bonuses; voluntary employee contributions to certain deferred compensation plans, such as 401(k) plans; employee gains from exercising nonqualified stock options; and receipts in kind that represent income. Wage and salary accruals consist of *disbursements* and *wage accruals less disbursements*. Disbursements is wages and salaries as just defined except that retroactive wage payments are recorded when paid rather than when earned. Accruals less disbursements is the difference between wages earned, or accrued, and wages paid, or disbursed. In the NIPA's, wages accrued is the measure used for national income, and wages disbursed is the measure used for personal income.
Supplements to wages and salaries consist of employer contributions for social insurance and of other labor income. *Employer contributions for social insurance* consists of employer payments under the following Federal Government and State and local government programs: Old-age, survivors, and disability insurance (social security); hospital insurance; unemployment insurance; railroad retirement; pension benefit guaranty; veterans life insurance; publicly administered workers' compensation; military medical insurance; and temporary disability insurance. *Other labor income* consists of employer payments (including payments in kind) to private pension and profit-sharing plans, publicly administered government employee retirement plans, private group health and life insurance plans, privately administered workers' compensation plans, supplemental unemployment benefit plans, and several minor categories of employee compensation (including judicial fees to jurors and witnesses, compensation of prison inmates, and marriage fees to justices of the peace).

PI : Proprietors' income (with inventory valuation and capital consumption adjustments) is the current production income (including income in kind) of sole proprietorships and partnerships and of tax-exempt cooperatives. The imputed net rental income of owner-occupants of farm dwellings is included; the imputed net rental income of owner-occupants of nonfarm dwellings is included in rental income of persons. Proprietors' income exclu des dividends and monetary interest received by nonfinancial business and rental income received by persons not primarily engaged in the real estate business; these incomes are included in dividends, net interest, and rental income of persons.

R : Rental income of persons (with capital consumption adjustment) is the net current-production income of persons (except those primarily engaged in the real estate business) from the rental of real property, the imputed net rental income of owner-occupants of nonfarm dwellings, and the royalties received by persons from patents, copyrights, and rights to natural resources.

Π : **Corporate profits (with inventory valuation and capital consumption adjustments)** is the net current production income of organizations treated as corporations in the NIPAs. These organizations consist of all entities required to file Federal corporate tax returns, including mutual financial institutions and cooperatives subject to Federal income tax, private non-insured pension funds, nonprofit institutions that primarily serve business, Federal Reserve banks, and federally sponsored credit agencies. With several differences, this income is measured as receipts less expenses as defined in Federal tax law. Among these differences are the following: Receipts exclude capital gains and dividends received, expenses exclude depletion and capital losses and losses resulting from bad debts, inventory withdrawals are valued at replacement cost, and depreciation is on a consistent accounting basis and is valued at replacement cost using depreciation profiles based on empirical evidence on used-asset prices that generally suggest a geometric pattern of price declines. Because national income is defined as the income of U.S. residents, its profits component includes income earned abroad by U.S. corporations and excludes income earned in the United States by the rest of the world.

Profits before tax is the income of organizations treated as corporations in the NIPA's except that it reflects the inventory-accounting and depreciation accounting practices used for Federal income tax returns. It consists of profits tax liability, dividends, and undistributed corporate profits.

Profits tax liability is the sum of Federal, State, and local government income taxes on all income subject to taxes; this income includes capital gains and other income excluded from profits before tax. The taxes are measured on an accrual basis, net of applicable tax credits.

Profits after tax is profits before tax less profits tax liability. It consists of dividends and undistributed corporate profits.

Dividends is payments in cash or other assets, excluding the corporations' own stock, that are made by corporations located in the United States and abroad to stockholders who are U.S. residents. The payments are measured net of dividends received by U.S. corporations. Dividends paid to State and local governments are included. *Undistributed profits* is corporate profits after tax less dividends. *Inventory valuation adjustment* (IVA) is the difference between the cost of inventory withdrawals valued at acquisition cost and the cost of inventory withdrawals valued at replacement cost. The IVA is needed because inventories as reported by business are often charged to cost of sales (that is, withdrawn) at their acquisition (historical) cost rather than at their replacement cost (the concept underlying the NIPAs). As prices change, businesses that value inventory withdrawals at acquisition cost may realize profits or losses. Inventory profits, a capital-gains-like element in business income (corporate profits and nonfarm proprietors' income), result from an increase in inventory prices, and inventory losses, a capital-loss-like element, result from a decrease in inventory prices. In the NIPAs, inventory profits or losses are shown as adjustments to business income; that is, they are shown as the IVA with the sign reversed. No adjustment is needed to farm proprietors' income because farm inventories are measured on a current-market-cost basis.

NI : Net interest is the interest paid by private business less the interest received by private business, plus the interest received from the rest of the world less the interest paid to the rest of the world. Interest payments on mortgage and home improvement loans and on home equity loans are included in interest paid by business because home ownership is treated as a business in the NIPA's. Interest received by private non-insured pension plans is recorded as being directly received by persons in personal income (see below). In addition to monetary interest, net interest includes imputed interest, which is paid by corporate financial business. For regulated investment companies, imputed interest is measured as operating expenses. For depository institutions and life insurance carriers, imputed interest is measured as the difference between the property income received on depositors' or policyholders' funds and the amount of property income paid out explicitly. The imputed interest paid by life insurance carriers attributes their investment income to persons in the period it is earned. The imputed interest payments by financial intermediaries (other than life insurance carriers) to persons, governments, and to the rest of the world have imputed service charges as counterentries in GDP and in income payments to the rest of the world; these charges are included in PCE, in government consumption expenditures and gross investment, and in exports of goods and services, respectively.

BTr : *Business transfer payments* consists of payments *to persons* and *to the rest of the world* by private business for which no current services are performed. Business transfer payments to persons consist primarily of liability payments for personal injury and of corporate gifts to nonprofit institutions. Business transfer payments to the rest of the world consists of nonresident taxes—that is, taxes paid by domestic corporations to foreign governments.

T_{YMS} : Taxes on production and imports consists of (1) tax liabilities that are chargeable to business expense in the calculation of profit-type incomes and (2) certain other business liabilities to general government agencies that are treated like taxes. Indirect business taxes includes taxes on sales, property, and production. Employer contributions for social insurance are not included. Taxes on corporate incomes are also not included; these taxes cannot be calculated until profits are known, and in that sense, they are not a business expense. Nontaxes includes regulatory and inspection fees, special assessments, fines and forfeitures, rents and royalties, and donations. Nontaxes generally exclude business purchases from general government agencies of goods and services that are similar to those provided by the private sector. Government current receipts from the sales of such products are netted against government consumption expenditures.

GES : Subsidies less current surplus of government enterprises is the monetary grants paid by government agencies to private business and to government enterprises at another level of government. The *current surplus of government enterprises* is their current operating revenue and subsidies received from other levels of government less their current expenses. In the calculation of their current surplus, no deduction is made for net interest paid. The current surplus of government enterprises is not counted as a profit type income, and therefore, it is not counted as a factor charge. Subsidies and current surplus are shown as a combined entry because deficits incurred by some government enterprises may result from selling goods to business at below-market prices in lieu of giving them subsidies.

CFC : Consumption of fixed capital is the charge for the using up of private and government fixed capital located in the United States. It is defined as the decline in the value of the stock of assets due to wear and tear, obsolescence, accidental damage, and aging. For most types of assets, estimates of CFC are based on geometric depreciation patterns; empirical studies on the prices of used equipment and structures in resale markets have concluded that a geometric pattern of depreciation is appropriate for most types of assets. For general government and for nonprofit institutions that primarily serve individuals, CFC is recorded in government consumption expenditures and in PCE, respectively, as a partial measure of the value of the current services of the fixed assets owned and used by these entities. *Private capital consumption allowances* consists of tax-return-based depreciation charges for corporations and nonfarm proprietorships and of historical-cost depreciation (calculated by BEA, using a geometric pattern of price declines) for farm proprietorships, rental income of persons, and nonprofit institutions. *Private capital consumption adjustment* is the difference between private capital consumption allowances and private CFC.

IncRoW : Income receipts from the rest of the world consists of receipts by U.S. residents of foreign interest and dividends, of reinvested earnings of foreign affiliates of U.S. corporations, and of compensation paid to U.S. residents by foreigners. *Income payments to the rest of the world* consists of payments to foreign residents of U.S. interest and dividends, of reinvested earnings of U.S. affiliates of foreign corporations, and of compensation paid to foreigners by U.S. residents.

Appendix 2 – Further comments on VECs.

Let us first recall the general representation of a VEC model containing $X_t=(x_{1t},\ldots,x_{nt})$ I(1) variables indexed in time :

$$VEC(k): \quad \Delta X_t = \underbrace{\alpha.\beta'.X_{t-1}}_{long-run} + \underbrace{\sum_{i=1}^{k-1} \Gamma.\Delta X_{t-i}}_{short-run} + \underbrace{\mu_0 + \mu_1.t}_{deterministic\ component} + \underbrace{\Phi D_t}_{exogenous\ regressors} + \underbrace{\varepsilon_t}_{gaussian\ errors}$$

where k is the number of past values of each (differenced) variable used to explain the dependant variable, α is a $r*n$ matrix of coefficient loadings to the cointegrating relations (r being the rank of matrix Π), β' contains $r*n$ the 'long-run' or 'steady-state' coefficients, Γ is the 'short-run' or 'differences' coefficient matrix, D_t is a set of exogenous variables (not discussed here) and ε_t is a set of Gaussian errors.

The rest of this appendix provides an intuitive interpretation of the cointegrating relationships as well as the two tests measuring their number, presents and discusses the adjustment loadings, and introduces the five cases types of deterministic component.

First, $\beta' x_{t-1}$ are (is) the cointegrating relation(s), that is the relationship(s) linking all variables. Those cointegrating relationships are also called common trends, since they are interpretable as the common forces that bound *all* variables at the same time. This is (these are) cointegrating relationships in the sense that some linear combinations of the series, which are I(1), become I(0), thus fulfilling the stationarity requirements of efficient estimation. The coefficients of such stationary linear combinations are piled into the β' matrix.

Yet the number of such cointegrating relationships remains to be estimated since we do not know how many different forces drive all the variables. Johansen provides two tests, the trace test and the maximum eigenvalue test, to test for the number of such cointegrating relationships. Note that the asymptotic critical values of those tests crucially depend (1) on whether or not a set of exogenous regressors is present (D_t) and (2) on the deterministic specification of the cointegrating relationships the researcher chooses (μ_0,μ_1, see below). Note also that the test may result in the number of cointegrating relationship being zero so that there may not be any significant cointegration between the variables.

Second, once those cointegrating relationships or 'long-run', 'steady-state' relationships are estimated, they enter the error-correction part of the model. Those relationships are stationary around the deterministic part of the model and there exists deviations from the trend/constant (see more below). Such deviations are interpreted as errors, which explain every variable of the system. For example, let us think of a system composed of only two variables, say GDP and consumption. Since there are only two variables, there can be at most one cointegrating relationship. Since the share of consumption in GDP is roughly stable, one can think of a common force, or cointegrating relationship, which drives *both* variables. In practice such a cointegrating relationship exists and *roughly* represents the share of consumption of GDP through time, scaled to revert around a trend or a constant. Johansen proves that there exists a representation in which those deviations from the 'steady-state' explain every variable in the system. Doing so, we explain both variables as a function of the share of consumption in GDP ; intuitively, if at some point in time we are below the 'steady-state' or 'long -run' value of the share of consumption in GDP, one of the two variables will have to move in such a way as to restore the 'long-run' value of that ratio. For example, during a time of below-average consumption-to-GDP ratio, consumption is likely to increase to restore the long-run value of that ratio. The magnitude of this adjustment of the variables is captured in the α coefficients, which are termed 'adjustment coefficients' after Johansen. Note that those adjustment coefficients need not be all individually or jointly significant ; a system may come out estimated with non-error-correcting variables, or with variables that error-correct in the wrong direction (variables push the process further away equilibrium each time a maladjustment occurs). Also the magnitude of the adjustment, the size of alpha, represents the speed of convergence towards the steady-state.

Third, as mentioned above the deterministic component of the model is an important choice because it has clear implications for estimation. In the general model above, we specify the deterministic components as $\mu_0 := \alpha\beta_0 + \gamma_0$ and $\mu_1 := \alpha\beta_1 + \gamma_1$. Five cases arise from there on, ranging from a significant quadratic trend in the data to no trend and no constant in the data.

Case 5 : no restriction on μ_0, μ_1 implies that there is a quadratic trend in the data, or equivalently that the growth rates follow a timely trend.

Case 4 : $\gamma_1 = 0$ implies that there is a linear trend in the data, and this trend does not cancel out in the cointegrating relationships. Thus the cointegrating relationships contain a significant trend, but the rest of the model (the error-correction part) does not contain any trend and features a constant only. This case appears to be a good one, albeit needs to be tested for, since (1) our variables appear to broadly follow a trend (see unit root tests), and (2) this case is particularly suitable for trend-stationary variables as corporate profits is (see unit root tests).

Case 3 : $\mu_1 = 0$ implies that there is a linear trend in the data and it does cancel out in the cointegrating relationship. This case may be the one of choice if the trending series feature a trend that cancels out in the cointegrating relationship. In that case the constant is unrestricted and may belong either to the cointegration space or to the error-correction part of the model.

Case 2 : $\mu_1 = 0, \gamma_0 = 0$ but $\beta_0 \neq 0$ implies that there are no linear trends in the data, and the constant is restricted to lie in the cointegration space. This case may be good if the trends we observed earlier on were spurious trends.

Case 1 : $\mu_1 = 0, \mu_0 = 0$ implies that there is no deterministic component in the data. This would imply that the cointegrating relationship has zero mean, which is a bad choice since the data does not start from zero in 1954q1.

Please note that Johansen's original five cases are all nested into one another, case four being a restricted version of case five, etc… The appropriate method is therefore to start with an assumption of case five, test for the presence of a quadratic trend in the data (e.g. *via* a LM test), and if rejected, carry on the analysis with case four. Such a method avoids the annoying pitfall of VECs which states that 'the deterministic component is an assumption of the researcher'.