The Dynamics of Portfolio Management: Exchange Rate Effects and Multisector Allocation

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ABSTRACT

The aim of this paper is to analyze the impact that recent changes in companies strategies (they refocused on their basic activities and they internationalized them) can have on their market value. Through that analysis, we intend to establish a suitable logic that could be adapted to portfolio management. This logic has to do with the first level of the top-down approach: it confronts multisector allocation to the exchange rate effects affecting company's market value.

In the first part, we detail the basis of this three dimensional logic. In the second part, we provide an empirical analysis of the French stock market behaviour between 1994 and 2004. Our analysis highlights the three-dimensional aspects of the pricing of French equities: (1) by confronting the position of the different French economic sectors to the US business cycle; in other words, we will determine if these sectors are lagging or early compared to the leading US cycle; (2) by taking into account their offensive, neutral or defensive behavior against the US market; (3) by taking into account the favorable or unfavorable fluctuations of the exchange rate and their influence on these sectors.

The resulting taxonomy that we confront to the different phases of the US business cycle allows us to define the basic principles of a multisector allocation, which governs the strategic choices to be made for investment portfolio.

JEL Classification: E32, F23, G11, G12

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I.   INTRODUCTION

Since the early 90s, the development strategies adopted by most major firms have been following two major trends linked to the process of industrial and financial consolidation. First, they refocused on their basic activities and secondly they increasingly internationalized their activities as a result of market globalization.

Moreover, because of globalization, national stock market cycles tend to follow one another at a faster pace; in other words, the creation of a single capital market is a process that has been largely confirmed. But it is far from being the case for national business activity cycles. It is rather the other way round[1]. Companies take advantage of the gaps existing between the economic cycles to ensure their development. Consequently there has been a wider disconnection between each country's market performance and its economic activities, since companies profit forecasts are less and less linked to the evolution of their national economy only.

Yet, as there is no adequation of the national cycles, one may wonder how they are linked to one another. It seems that the American economy plays a leading part in the world economy and is regarded as a reference by all the stock markets. In other words, if the international financial integration considers the US market as a leader whose cyclical evolution could be exclusively linked to that of the American economy, therefore, the other markets are indirectly influenced by the American economic situation.

Consequently these evolutions lead to tremendous changes in the logic of portfolio management. The top-down approach prompts portfolio managers to choose shares first sectorwise rather than geographically[2]. Secondly though portfolio managers were responsible for managing exchange risks through their ability to diversify portfolios geographically, it is now companies' responsibility[3].

A domestic macroeconomic situation in the business cycle *de facto* encompasses a more or less large variety of the positioning of the different sectors in this cycle: some can be early whereas others can be lagging. The fact that companies have refocused on their basic activities allows us to classify them clearly in the sectors they belong to; as a consequence, it becomes possible to use the logic of multisector allocation for portfolio dynamic management (Berdot, Goyeau and Léonard (2005)).

The implementation of this logic is nevertheless complex because several factors have to be taken into account simultaneously: (1) the international time lags of the macro business cycles, (2) the national and international lags of the sectoral cycles, (3) the exchange rate effects linked to the international diversification of companies' activities in the sector they operate in.

Regarding the last factor, let us underline that what determines the exchange rate is a matter for financial macroeconomics. It results that this exchange rate represents an exogenous variable for companies. They just have to anticipate its evolution and manage the risks they can be confronted to.

This paper aims at analysing the consequences of these changes on the pricing of companies by the market. Our goal is to set up a logic adapted to portfolio management. This dynamic has to do with the first level of the top-down approach. It

confronts multisector allocation to the exchange rate effects affecting company's market value.

The second part of this paper details the founding principles of that threefold logic. In the third part we analyse the French stock market evolutions between 1994 and 2004. Our analysis is supposed to highlight the three-dimensional aspects of the pricing of French equities: (1) by confronting the position of the different sectors to the American business cycle; in other words, we determine if they are lagging or early compared to the US cycle, (2) by taking into account their offensive, neutral or defensive behaviour in comparison with the American market, (3) By taking into account the favourable or unfavourable behaviour of the exchange rate effects influencing these sectors.

Our approach lies at the crossroads of three different questions tackled by specialists. We examine whether the intensification of commercial and financial integration has reinforced the synchronization of the national economic cycles or not. Does the exposure to exchange rate risks have an impact on firms pricing? Finally, how can we define an effective strategy for portfolio management on the basis of multisector allocation?

II.   PORTFOLIO DYNAMIC MANAGEMENT: MULTISECTOR ALLOCATION AND EXCHANGE RATE EFFECTS

A.   Macroeconomic Cycle and Sectoral Dynamic Allocation

The logic of sector allocation is based on two criteria (Berdot, Goyeau and Léonard (2005)): first the lags existing between sectors (early, neutral or lagging sectors) and confronted to the economic cycle as a whole and then how receptive these sectors can be regarding the market as a whole (offensive, neutral or defensive sectors).

Figure 1 below gives an overview of the different types of strategies adopted for financial investment in connection with the different phases of the business cycle. This chart exemplifies the link existing between the different phases of the effective business cycles and the decisions made regarding portfolio management. These decisions result from investors' ability to anticipate the next phase of the business cycle.

To illustrate the dynamics of portfolio management, we will choose a recession as our starting point. In these circumstances, portfolio managers anticipate a recovery and if they want to make the most of it, they will logically opt for both the earliest and most offensive sectors. In addition to investors' convictions, the conditions of the market rates are particularly favourable (low interest rates, etc). Then, gradually as the recovery is under way, the uncertainties of a future growth fade away accordingly, which confirms the attraction of the offensive sectors, and even the lagging offensive sectors. Yet the previous situation of the interest rates still remains unchanged, which prompts investors to opt for the offensive sectors.

Considering that the expansion phase is meant to last and that it has been anticipated as such, it logically leads to invest in the neutral sectors that are likely to evolve like the stock market as a whole. The neutral sectors selected are first the early ones, then the more or less lagging behind the economic activity.

Figure 1
Macroeconomic cycle and sectoral portfolio allocation
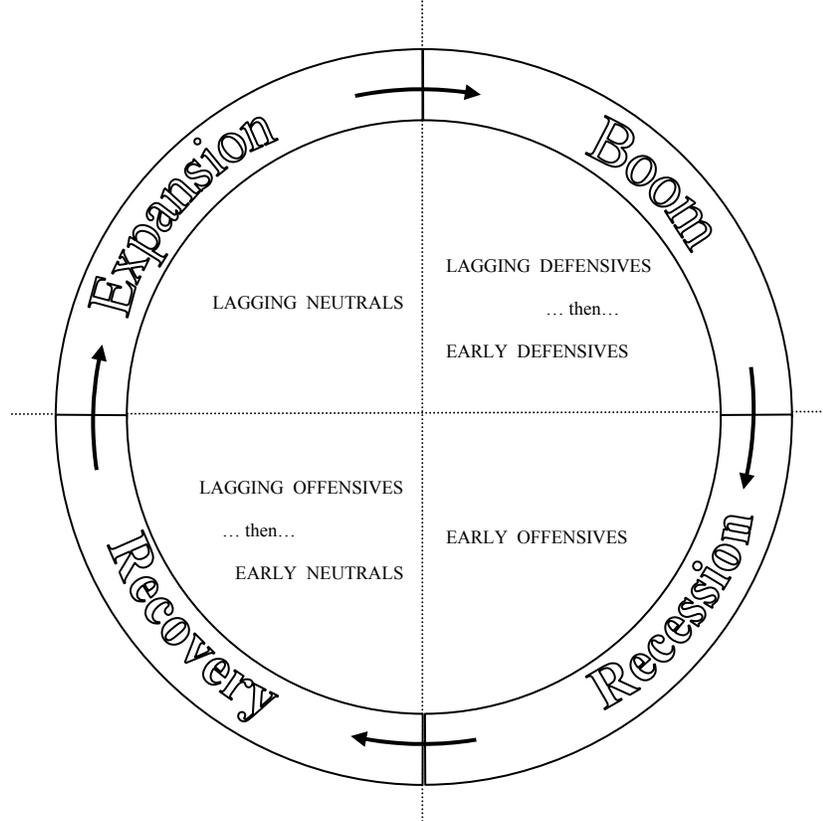
Source : BERDOT, GOYEAU and LÉONARD (2005)

The boom, characterized by a significant slow-down of economic growth and/or a rise in inflation, leads to a disruption concerning the investment strategies. This so-called disruption leads investors to invest first in the lagging sectors and then shift to the defensive ones. Whatever the situation, investing in the defensive sectors is meant to reduce the expected impact that recession will have on portfolio pricing. In that case, investors first concentrate on the lagging defensive sectors whose performance is relatively favourable, then on the early defensive ones as soon as the most part of their correction seems to have been achieved.

B.   Accounting for Exchange Rate Effects

The analysis of the link between market performance and exchange rate implies to investigate the relationship between the exchange rate and the profits forecasts, provided that market pricing is based on the flows of expected profits. The exchange rate effects on the expected profits go through three channels: (1) the profit margin, (2) the market share, and (3) the conversion of profits from one currency to another.

The interplay between these three channels depends on where production and sales are located. To illustrate this reasoning, we distinguish between two areas: the Euroland and the dollar area. Each of them corresponds to the country (or countries) where all transactions are carried out in the currency used in the corresponding area or in other currencies pegged to that currency. Let us consider that the dollar depreciates against the euro. We focus on the companies operating in the Euroland (but we do not take into account the fact that some companies operating in the dollar area may import inputs from the Euroland).

As shown in Table 1 below, four cases can be considered:

(1)   Goods are both produced and sold in the Euroland,
(2)   Goods are produced in the Euroland but sold in the dollar area,
(3)   Goods are produced in the dollar area but sold in the Euroland,
(4)   Finally, goods are both produced and sold in the dollar area.

Table 1
Impacts of a US dollar depreciation on Euroland firms

Sales	Production	
	Euroland	**Dollar area**
Euroland	Unfavourable « profit margin » and/or « market share » impact	Favourable « profit margin » and/or « market share » impact
Dollar area	Unfavourable « profit margin » and/or « market share » impact	Unfavourable conversion impact

Companies selling and producing goods in the Euroland can benefit from lower costs in euro on inputs priced in dollar and consequently it reduces their costs but not as much as in the case of their competitors operating in the dollar area; indeed the latter can take advantage of the impact that the dollar depreciation has on their whole costs of production when converted in euros.

As a result, the dollar depreciation has a significantly negative effect on European companies[4]. They either have to reduce their profit margins if they want to keep their market shares or their margins unchanged but in that case, they should be ready to lose some of their market shares. But in both cases, the profits made by the companies in the Euroland will decrease because of the final effect of the dollar depreciation. In the first case, companies are directly affected (through the decrease in

their margins) but in the second, they are indirectly affected through the impact of the unfavourable variation of demand on the value of their turnover. The resulting effects of the dollar depreciation on the profits are in any case linked to the price-elasticity of the demand[5] on the Euroland market as well as to the competition on this market (companies pricing power).

Companies producing in the Euroland and exporting to the dollar area are exposed to the same effects and the same loss of competitiveness as in the previous case except this time the impact depends on the price-elasticity of the demand on the dollar area market.

The companies in the Euroland which have relocated their activities in the dollar area so as to import back to the Euroland can really benefit from a decrease in their costs of production as priced in dollar and converted in euros, as is also the case for the companies in the dollar area, which is a substantial competitive advantage for them, compared to their competitors in the Euroland, who have not relocated their activities. This favourable situation can lead them either to increase their profit margins without losing any of their market shares or to keep their margins unchanged and increase their market shares. As a result, the dollar depreciation is supposed to entail an increase in the expected profits for the companies who have not relocated their production in the dollar area.

Eventually, the dollar depreciation has no effect on the costs of production and competitiveness of the European companies who have chosen to relocate their production in the dollar area so as to break into the markets of that area. There will be no effect on their profits made in dollar (because both the selling prices and costs of production are in dollar) although they will decrease after being converted in euros for accounting purposes.

It results that companies may reduce the impact of the dollar depreciation either by adopting allocative strategies (relocating their activities or importing from the dollar area) or through financial strategies (namely: hedging strategies). However these two strategies are really different. On the one hand, allocative strategies are difficult to be reverted in the short run and may prove detrimental in case of a dollar appreciation. On the other hand, financial strategies, though more flexible, have a cost that repeatedly undermines companies' profits.

Most of the empirical studies carried out to analyze company's exposure to foreign exchange rates follow Adler and Dumas theoretical approach (1984) and analyze to what extent companies are sensitive to exchange rates variations. Their results are controversial. Nevertheless most of the studies carried out highlight a low degree of exposure, not to say negligible[6, 7]. Yet company's exposure to foreign exchange rates risks, as analysed in most studies, is incomplete; indeed the sample chosen takes only into account the case of export companies[8].

III.   EMPIRICAL EVIDENCE FOR THE FRENCH MARKET (1994/2004)

The impact that the process of integration of the economy has on the synchronization of economic cycles is far from easy to understand because this may result in a higher specialization of national economies, which consequently would expose them rather to

specific sectoral shocks than systematic shocks. Most empirical studies dealing with that question[9] show that the intensification of commercial and financial integration as noticed recently, has led to increasing links between national (or regional) business cycles[10]. But it goes further than an increasing synchronization of economic cycles. Indeed Europe (especially France, Germany and Italy) would be more sensitive to shocks from North America (the USA and Canada). On the contrary, the latter would be less and less vulnerable to shocks from Europe (see Monfort and alii (2004)).

Our empirical analysis of the French stock market is based on that observation and highlights the leading role that the US economy and its stock market play on the pricing of French equities. For our analysis (from June 1994 to October 2004), all the data collected are given on a monthly basis. The stock market data are taken from Datastream[11]. The American industrial production data come from the Federal Reserve Bank of New York.

Concerning the relevance of our estimations, the period chosen provides a significant advantage; it covers three really distinct sub-periods on the economic level as well as on the stock market level:

(1)   A period of slow economic development followed by a boom and a correction; in other words a complete economic and stock market cycle.
(2)   It also covers three distinctive sub-periods for the euro/dollar exchange rate: a depreciation followed by an appreciation and finally a depreciation of the dollar against the euro (see chart below)

Since these sub-periods do not overlap, the exchange rate effects can be differentiated from the effects of economic growth (see Figure 2).

We analyze the exchange rate risk through the evolutions of the euro/dollar parity only, which thus implies that the exchange rate risk for the other currencies is totally diversified and will not cause any specific effect on the market value of companies. The justification of this hypothesis lies first in the importance of the dollar as the international currency used for pricing both inputs and finished goods, then in the bipolarity of international financial system, especially since the euro came into effect. It is generally characterized by fluctuations of the dollar against all the other currencies that are not pegged to it. In the specific context of our study, our hypothesis is justified by the leadership of the American economy[12].

We have to assess:

(1)   first the time lags existing between French sectoral pricing and the dominant international economic situation, as summarized by the American economic situation,
(2)   then, (thanks to a multifactor model) we also assess how sensitive French sectoral pricing can be to the euro/dollar exchange rate and to French and American stock markets.

Figure 2
Gap relative to trend (US production) and Euro/Dollar exchange rate
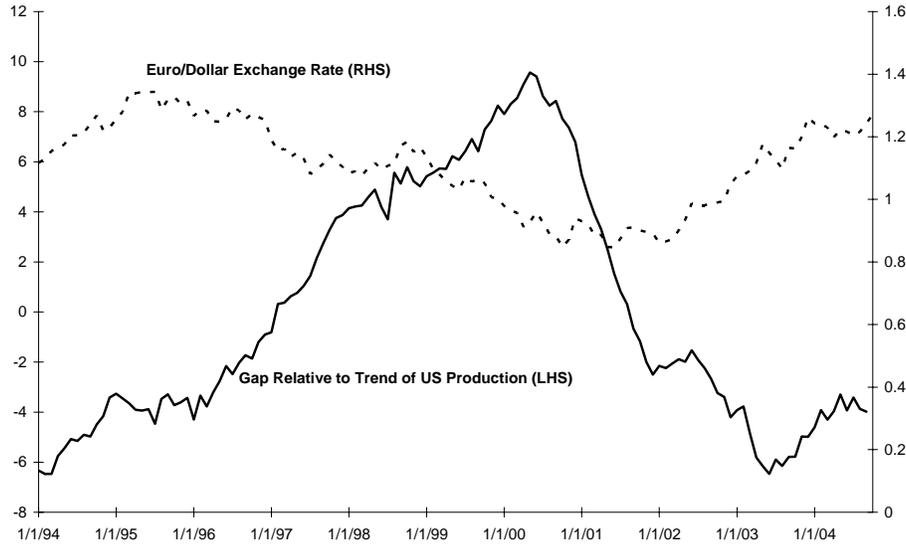
A.   Sectoral Pricing and International Economic Cycle

One has first to check if stock market and business cycles (this last one measured by the gap between actual industrial production and its trend) coincide with one another and more precisely if stock market cycles are early or lagging compared to business cycles. Our aim is neither to spot the turning points nor to draw any conclusions on their would-be coincidence. That approach views cycles as a series of expansion and recession phases separated by peaks and troughs. In other words one would simply have to identify and draw together the turning points of the two series to analyze their coincidence[13].

That is not our objective. We rather aim at examining the coincidence of the two cycles by analyzing the covariations of the series for the period considered without focusing on turning points. The index chosen to measure their coincidence does not correspond to the average number of periods in which two series happen to be in the same cycle. But it precisely takes into account the number of periods in which the two variables considered follow the same upward or downward trend and this for different time lags or leads[14].

To verify if a variable Y leads or lags compared to a variable X, we have to calculate the frequency (f) of similar covariations between Y_t and X_{t+h}, both for negative, null or positive values of h. We then keep the value of h that maximizes the frequency (f). Three values have to be taken into account:

(1)   if h = 0, Y_t and X_t have coincidental cycles or more exactly they evolve simultaneously,
(2)   If h > 0, Y_t, which varies as X_{t+h}, is early compared to X_t,
(3)   If h < 0, Y_t, which varies as X_{t+h}, is lagging compared to X_t

To obtain more relevant results, we calculate the estimated standard deviation of the frequencies in order to measure their Student t-statistics (expressed in the case of a null hypothesis of random variations corresponding to a percentage of covariations equal to 50%).

If we consider the French stock market as a whole (through the CAC 40 index), the gap to the American economy corresponds to h = 3 (where h is calculated with values ranking from –12 to 12 months). For h = 3, the covariations frequency gives f = 61.9% (with t equal to 2.752), which is significant. The French stock market cycle would be three months earlier than the American business cycle.

Table 2

Time lag between Cac40 index and gap relative to trend: h	Frequency	Student t statistic
2	0.614	2.643
3	0.619	2.752
4	0.600	2.282

This general result tends to show a relative shortsightedness of the market; yet it includes a large variety of different sectoral situations. Indeed, similarly to all sectoral economic situations, which are significantly early or lagging compared to the general economic situation, stock market performances are logically supposed to mirror these time lags.

We use the FTSE international sectoral classification to examine more accurately how the stock market reacts sectorwise to the evolution of the US economic activity. It should allow us to highlight significant time lags (leads or lags) in the way the stock market sectors react, which would show that investors behave quite rationally. They would take into account the whole American economic situation to opt for sectoral investments, by using their implicit knowledge of time lags in sectoral economic cycles against the international business cycle. The sectoral allocation strategies adopted by investors during the economic cycle would be based on that behavior.

The taxonomy of sectors (based on whether they are early or lagging compared to the US economic activity) results from the same methodology as the one used for the CAC 40 index. The results obtained[15] reveal significant differences in the sectoral time lags over a whole year. To synthesize the results, the sectors have been divided in four different categories (only one sector is completely synchronous):

(1)   very early sectors (from 4 to 5 months),
(2)   early or synchronous sectors (from 0 to 3 months),
(3)   lagging sectors (from 1 to 3 months),
(4)   strongly lagging sectors (from 4 to 7 months).

Table 3
Taxonomy of sectoral time lags[1]

LAGGING SECTORS		EARLY (or synchronous) SECTORS	
4 to 7 months	1 to 3 months	0 to 3 months	4 to 5 months
(-7)	(-1)	(0)	(4)
Food producers & processors	Automobiles & Parts	Health*	**Cyclical consumer goods***
Banks	Leisure & hotels*	(1)	Engineering & machinery*
Non-cyclical consumer goods*		Insurance*	(5)
		Real Estate*	Information technology hardware
Pharmaceuticals & biotechnology*		(2)	**Information technology***
		Beverages	
		Chemicals*	
		(3)	
		Steel & other metals*	
		Aerospace & defence*	
		Construction and building materials*	
		General retailers*	
		Food & drug retailers*	
		Electronic & electrical equipment	
		Household goods & textiles*	
		Personal care & household products*	
		Basic Industries	
		Diversified industrials*	
		General industrials*	
		Software & computer services*	
		Media & entertainment*	
		Oil & gas*	
		Resources*	
		Utilities*	
		Cyclical services*	
		Non-cyclical services*	
		Supports services *	
		Speciality & other finance	
		Financials*	
		Transport*	

[1] Bold types : FTSE groups. In each column, time lags are mentioned in number of months.
 * indicate a significant Student t statistic (at a 5% level).

That taxonomy reveals implicit rational behavior for investors regarding how they assess the economic evolutions. The capital goods sector, which is in the early stage of the production process, is logically the earliest. On the contrary, many other sectors directly linked to current situation are lagging more or less behind the US business cycle. In that matter, it is no surprise if the sector of non-cyclical consumer goods is extremely lagging (which is mainly due to its inertia to the current economic situation). It is the reverse for the sector of non-cyclical services and it is not surprising since this sector includes telecommunication services, a sector which coincides with investments in new technologies (networks).

B.   Sectoral Pricing: Exchange Rate Effect and Market Effect

We are now going to see how sectoral rates of return are sensitive to exchange rate fluctuations. However the exchange rate cannot be the only variable to consider if we want to account for rates of return. If one follows the market model, one can choose (as a variable which will synthesize all the other factors) either the return of the national market index (in the case of a fragmented market) or the return of the world market (in the case of an integrated market)
However, since our analysis gives the US stock market the leadership, we will rather focus on the logic of a multisector model as an explanation for the French sectoral returns in relation to exchange rate evolutions and the performances of the whole French and American markets. We have taken the French market return as an explanatory variable to account for the fact that some sectors may also depend on specific national factors.
It is obvious that the two other variables required for the explanation have to be orthogonalized so as to tackle the problems linked to multicolinearity and single out the impact of each effect while stressing the impact of the exchange rate effect. On the one hand, the variable considered to account for the performance of the US stock market corresponds to the part of this rate of return that is left unexplained by the exchange rate. On the other hand, the variable considered to measure the performance of the French stock market corresponds to the part of this rate of return not accounted for by the exchange rate and the American stock market performance.
The dependent variable is the monthly rate of return of the sector i (which is the growth rate of its price index in euro expressed as a percentage). This variable is noted by R_{it}; the explanatory variable standing for the exchange rate effect is the monthly rate of growth (as a percentage) of the nominal exchange rate of the euro expressed in dollar. This "performance" of the euro is represented by $R€_t$.
The explanatory variable accounting for the American market performance, after orthogonalization, is calculated as the residuals of the following equation:

$$RNYSE_t = a_1 + b_1 R€_t + \varepsilon_{1t}, \qquad\qquad (1)$$

where RNYSE stands for the monthly rate of return of the NYSE index. The residual part is noted as RNYSERES.

The explanatory variable used to measure the French stock market effect is calculated as the residuals of the following equation:

$$RCAC_t = a_2 + b_2 R\text{€}_t + c_2 RNYSE_t + \varepsilon_{2t}, \tag{2}$$

where RCAC stands for the monthly rate of return of the CAC 40 index. The residual part is noted as RCACRES.

The estimated equations for each sector i are the following ones:

$$R_{it} = \alpha_i R\text{€}_t + \beta_i RNYSERES_t + \gamma_i RCACRES_t + \delta_i + \varepsilon_{it}. \tag{3}$$

For these estimations we have adopted a Newey-West approach to take into account the effects of heteroskedasticity and serial correlation (the detailed results are available on request).

a.   Market effect

Thanks to the β_i and γ_i coefficients, the multifactor model accounts for the sensitivity of sectoral returns vis-à-vis the French and American stock markets performances.

We can immediately conclude that the American stock market alone cannot account for French sectoral returns. The CAC 40 index (after orthogonalization) significantly accounts for French specificities (if we except the real estate and transport sectors for which the multifactor model used has no relevance).

The offensive or defensive aspect of the French sectors can only be estimated through the coefficient in relation to the US stock market performance if one takes into account the orthogonal representation of the French market performance (which eliminates the specific aspect of the international market).

The coefficient β of the multifactor model is an indicator of prime importance to explain how an equity or a sector reacts to the American stock market performance: $\beta = 1$ means that the return of an equity or a sector mirrors that of the market. Similarly, $\beta < 1$ ($\beta > 1$) means that the return of an equity or a sector softens (amplifies) the return of the stock market, either downwards or upwards. As a result, the β coefficient conveys the more or less offensive or defensive nature of an equity (or a sector) in relation to the stock market return.

That is why it is interesting to test the significance of the β coefficient, not only in relation to a value equal to 0 but also in relation to the unit value. The results are synthesized in the table below (the detailed results are available on request).

One can conclude that many sectors generally regarded as defensive (real estate, health, pharmaceuticals and biotechnology, food producers and processors, etc.) have a β coefficient < 1. Conversely, sectors regarded as offensive (household goods and textiles, information technology, etc.) have a β coefficient > 1.

Table 4
Taxonomy of sectoral sensivities[*]: market effect

Defensive sectors (β < 1)	Neutral sectors (β = 1)	Offensive sectors (β > 1)
Health	Food & drug retailers	**Cyclical consumer goods**
Beverages	Personal care & household	Software & computer
Non-cyclical consumer	products	services
goods	Oil & gas	Steel & other metals
Chemicals	**Resources**	Household goods & textiles
Real Estate	Engineering & machinery	Insurance
Food producers & processors	Diversified industrials	Information technology
Pharmaceuticals &	**Basic Industries**	hardware
biotechnology	**Non-cyclical services**	**Information technology**
Speciality & other finance	Transport	
	General industrials	
	Media & entertainment	
	Construction and building	
	materials	
	Supports services	
	Utilities	
	Aerospace & defence	
	Automobiles & Parts	
	Electronic & electrical	
	equipment	
	Cyclical services	
	General retailers	
	Banks	
	Financials	
	Leisure & hotels	

[*] In each column, sectors are ranked by increasing order of the t Student statistic (β = 1 test)

However one may be surprised by some sectors that are not to be found in the category they usually belong to: as it is the case with insurance companies for instance. The fact that they traditionally belonged to the defensive category had to do first with the non-cyclical aspect of their commitments and then with the prime importance of real estate (also considered as a defensive sector) in their assets. The fact that they have restructured their assets for securities (especially shares) instead of real estate has made them more sensitive to the behavior of financial markets; it all explains why they are to be found in the offensive sector category.

b.   Exchange rate effect

Thanks to the coefficients α_i, the multifactor pricing model also allows us to assess the sensitivity of sectoral returns in comparison with the euro "performance". Most of the

exchange rate effects are significantly negative. Sectors are then exposed to a dollar depreciation, as expected from the theoretical analysis. These results tend to show that relocation and hedging strategies implemented by French companies in the past few years do not protect them enough against the dollar exchange rate risk.

The transport sector is the only exception, which is not really surprising. In fact as it belongs to the services sector whose major costs (energy) are expressed in dollars, a dollar depreciation makes this sector more competitive, which in the end entails a positive effect on its pricing. Yet, the multifactor model hardly provides an explanation for this sector. The result obtained may be due to an unsatisfactory specification of the model. It is exactly the same situation for a few other sectors (namely beverages, real estate, engineering and machinery) on which the exchange rate effect (negative or positive) does not seem relevant.

Table 5
Taxonomy of sectoral sensivities[*]: exchange rate effect

Highly sensitive sectors $\alpha < -0.8$	Weakly sensitive sectors $-0.8 < \alpha < 0$	Other sectors α non significant or >0
Information technology hardware	**Non-cyclical services**	**Utilities**
Information technology	Food & drug retailers	Health
Media & entertainment	Construction and building materials	Beverages
Speciality & other finance	Oil & gas	Real Estate
Steel & other metals	**Resources**	Transport
Aerospace & défence	**Basic Industries**	Engineering & machinery
Automobiles & Parts	General retailers	
Cyclical consumer goods	Diversified industrials	
Insurance	Supports services	
Electronic & electrical equipment	Food producers & processors	
General industrials	Pharmaceuticals & biotechnology	
Software & computer services	**Non-cyclical consumer goods**	
Household goods & textiles	Chemicals	
Cyclical services	Personal care & household products	
Banks		
Leisure & hotels		
Financials		

* In each column, sectors are ranked by decreasing sensitivity order with respect to the euro/dollar exchange rate. Remember that the sensitivity is all the more high that the coefficient is highly negative.

The different sectors have been ranked in three categories according to their sensitivity to the dollar:

(1)   highly sensitive sectors ($\alpha < -0.8$)
(2)   weakly sensitive sectors ($-0.8 < \alpha < 0$)
(3)   other sectors (α non significant or $\alpha > 0$). The threshold noted $\alpha = -0.8$ corresponds to the median of negative sensitivities. However we have to underline that it is really difficult to draw conclusions about the differences between sensitivities because they combine cost effects, price effects, market share effects and hedging strategies for each sector.

If some sectors are weakly sensitive to exchange rate effects, it is because most of their pricing is based on the interaction of stock market effects.

III.   SECTORAL TAXONOMY AND ACTIVE PORTFOLIO MANAGEMENT

A.   A Two Dimension Sectoral Taxonomy, Excluding Exchange Rate Effects

In Table 6, we have put in perspective the offensive/defensive nature of French sectors in relation to the US business cycle.

Noticeably, the table shows that most sectors are positioned diagonally; in other words, it means that the earlier (the more lagging) a sector is on the general economic activity, the more offensive (defensive) it is and conversely, the more lagging it is, the more defensive it is, which is not surprising.

If we consider that betting on the stock market is all the more risky as investors have a longer time-horizon (which increases the risks linked to expectations), it seems logical to benefit from a higher yield; in that case the β coefficient will be higher.
In that matter, the information technology group really matches the positive relation existing between time-lead and risk level.

According to the same principle, the market followers which are lagging the most behind the business cycle and whose stock market behavior can be more easily forecast, are the least risky: hence their defensive nature. The pharmaceuticals and biotechnology sector perfectly illustrate this situation.

Finally, the "median" sectors in the table (which are slightly early compared to the business cycle and have a β coefficient not significantly different from 1) follow the same pattern: they have a weak lag and both the level of risk and the coefficient β have median values. We can see that about half of the sectors are to be found in this category, which may account for the fact that the French stock market (CAC 40 index) is three months earlier than the US business cycle.

Table 6
Sectoral taxonomy (excluding exchange rate effects)

			Sensivity to US Stock Market (β coefficient)		
			Defensive : β < 1	Neutral : β = 1	Offensive : β > 1
Sensivity to US Economic Activity	Lagging sectors	4 to 7 months	Food producers & processors **Non-cyclical consumer goods** Pharmaceuticals & biotechnology	Banks	
		1 to 3 months		Automobiles & Parts Leisure & hotels	
	Early sectors	0 to 3 months	Health Beverages Chemicals Real Estate Speciality & other finance	Aerospace & defence Construction and builing materials General retailers Food & drug retailers Electronic & electrical equipment Personal care & household products **Basic Industries** **General industrials** Diversified industrials Media & entertainment Oil & gas **Resources** **Utilities** **Cyclical services** **Non-cyclical services** Supports services **Financials** Transport	Insurance Steel & other metals Household goods & textiles Software & computer services
		4 to 5 months		Engineering & machinery	**Cyclical consumer goods** Information technology hardware **Information technology**

B.   Exchange Rate Effect and Multisector Dynamic Portfolio Allocation

According to the approach previously established, three factors have to be taken into account for portfolio arbitrage:

(1)   first how sectors are positioned in relation to the business cycle as a whole,
(2)   secondly, how sensitive sectors can be to the stock market behavior, and
(3)   thirdly, how sensitive sectors can be to the exchange rate.

To simplify the exposition of the conditions of that arbitrage, we consider two distinct situations: an anticipated appreciation of the dollar and an anticipated depreciation of the dollar. For each case, we have to define the conditions of multisector portfolio allocation through the use of the two other factors. It seems logical to focus on sectors highly sensitive to the dollar in the case of depreciation and to focus on sectors weakly sensitive to the dollar in the case of an appreciation. Thanks to the figures below, it will be easier to understand that portfolio management based on multisector portfolio allocation is obviously more complex to implement in the case of an expected depreciation of the dollar against the euro rather than in the case of an appreciation.
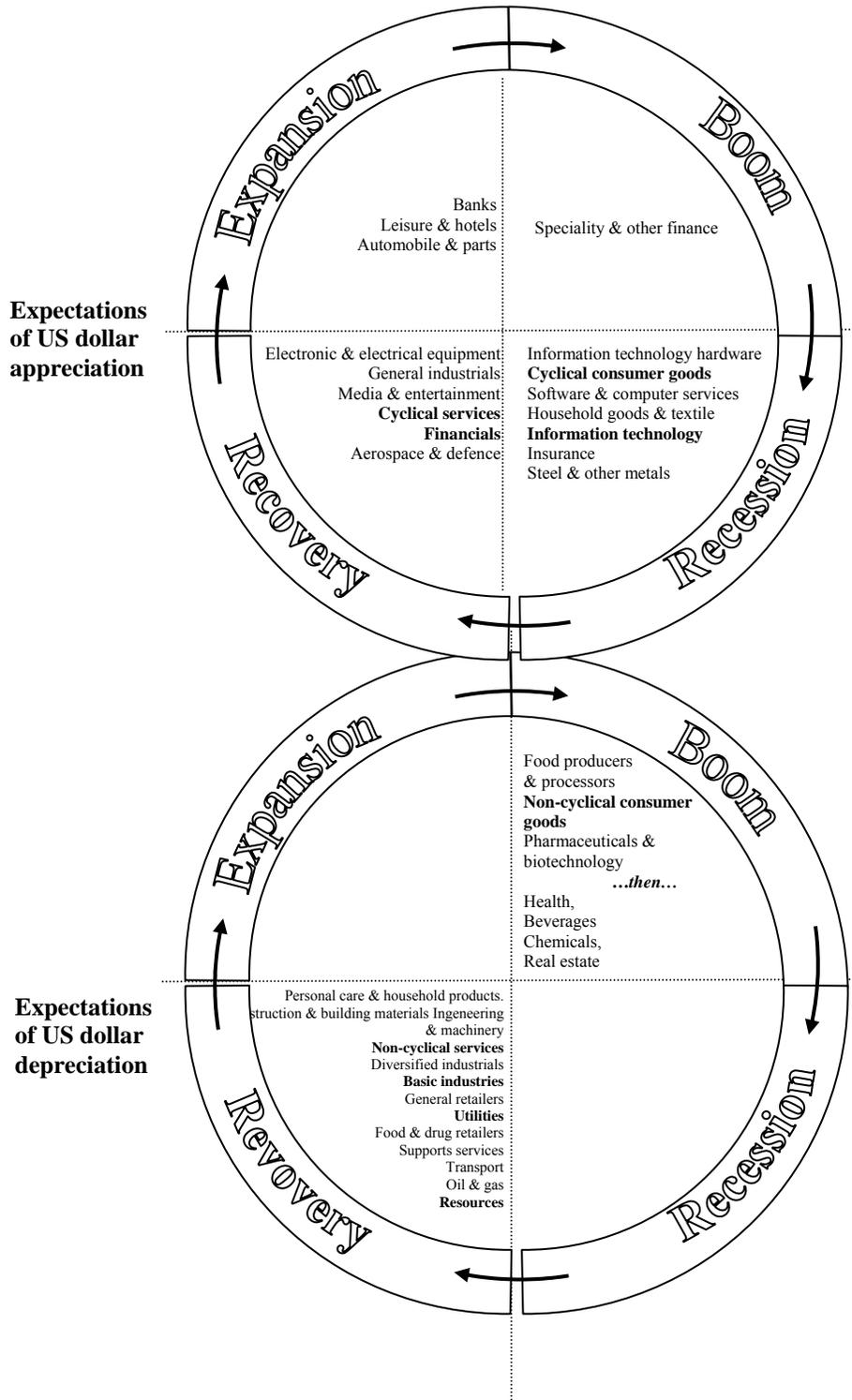
As a reminder, what we call dynamic portfolio allocation and what is at stake in this analysis consists in overweighting or underweighting sectors in relation to the contents of a stock market portfolio (benchmark). In other words, the sectors featuring in each phase of the cycle represented below are sectors that need to be overweighted. Consequently an empty quadrant implies that the market portfolio will have the best performance.

The two major conclusions drawn by Berdot, Goyeau and Léonard (2005) are confirmed when the exchange rate effect is taken into account:

(1) Unlike what was intuited, the economic expansion does not lead to major arbitrages. In other words, when the economic expansion is taking place, the most part of the offensive positioning already took place during the previous business cycle phases. However, in the case of a dollar depreciation, the defensive positioning process mainly takes place during the boom phase; on the contrary, in the case of a dollar appreciation which has an obvious positive effect on French companies pricing, the defensive positioning process has a limited scope.

(2) It is undeniably when a recession takes place that the most accurate image which best suits portfolio managers behavior is that of a runner racing far ahead of the others: it is evidenced, in the case of an anticipated appreciation of the dollar (which has a positive effect on French companies pricing), by investing in the information technology hardware sector and in software and computer services sector according to the following twofold pattern of that investment: sectors which are early on the business cycle (implicit risk) are expected to be profitable. On the contrary, in the case of an expected dollar depreciation, which negatively affects French companies pricing, no sector should be favored.

Figure 3

Expectations of US dollar appreciation

Expansion
Boom
Recovery
Recession

Banks
Leisure & hotels
Automobile & parts

Speciality & other finance

Electronic & electrical equipment
General industrials
Media & entertainment
Cyclical services
Financials
Aerospace & defence

Information technology hardware
Cyclical consumer goods
Software & computer services
Household goods & textile
Information technology
Insurance
Steel & other metals

Expectations of US dollar depreciation

Expansion
Boom
Recovery
Recession

Food producers
& processors
Non-cyclical consumer goods
Pharmaceuticals &
biotechnology
...then...
Health,
Beverages
Chemicals,
Real estate

Personal care & household products.
struction & building materials Ingeneering
& machinery
Non-cyclical services
Diversified industrials
Basic industries
General retailers
Utilities
Food & drug retailers
Supports services
Transport
Oil & gas
Resources

IV.   CONCLUSION

This paper has highlighted the principles and conditions required for an active portfolio management based on the process of multisector portfolio allocation and the expected impact of exchange rate effects. It allows us to define optimal strategies, which take into account investors' expectations concerning the euro/dollar exchange rate and by using two major criteria to rank sectors (whether they are early or lagging behind the business cycle, whether they are offensive or defensive sectors).

The resulting taxonomy, which has been put in perspective with the different phases of the US business cycle, has led to define the basic principles of multisector allocation that govern the strategic choices for an investment portfolio.

In the case of an expected dollar depreciation, this taxonomy helps to single out two categories of really strategic sectors:

(1) On the one hand, early sectors, consequently the riskiest but also the most profit-making ones, when the market is bullish,

(2) On the other hand, lagging sectors, consequently the safest but also the most profit-making ones, when the market is bearish.

Yet in the case of an expected dollar appreciation, which is always a more positive context for French companies, the taxonomy that we have set up implies overweighting portfolios in relation to the market portfolio, regardless of the phases of the business cycle.

Under these circumstances any active portfolio management based on multisector portfolio allocation implies to accept to be subjected to risks generated by the business cycle as a whole. The relevance of the normative dimension of this approach lies in the active management of both returns and risks.

ENDNOTES

1. For a further discussion of this question in the case of the G7 group, see Heitz, Hild and Monfort (2004) or in the case of the EMU, see Adjaoute and Danthine (2000).
2. See for example Berdot, Goyeau and Léonard (2001), Cavaglia, Brightman and Aked (2000), Forbes and Chinn (2003), Emiris (2004), Moerman (2004), Carrieri, Errunza and Sarkissian (2004).
3. See for example Bartov and Bodnar (1994), Bodnar and Gentry (1993), Chow, Lee and Solt (1997), Mefteh (2004), Choi and Zeghal (2002).
4. That case underlines the fact that companies which make transactions priced in foreign currencies (transaction risk) are not the only ones to be exposed to exchange rate risks. To be in competition with companies which price their product in foreign currencies is enough to expose any domestic company to exchange rate risks (economic risk).
5. For more details about sectoral price elasticities between the Euroland and the dollar area, see Fouquin and Alii (2001) as well as Benassy-Quere and Alii (2003).
6. Concerning French companies, see two studies: Louargant (1998) finds out that out of the 54 export companies studied, 50% of them revealed to be sensitive to the dollar. Mefteh (2004) finds out that 40% of the hundred export companies he

studies proved to be sensitive to exchange rate fluctuations (weighted exchange rate). Moreover according to these studies, if companies would not have similar sensitivities, these ones could be unstable in the long run.

7. Chow and Alii (1997) consider another approach which defines the exposure to exchange rate risks through real exchange rate fluctuations and distinguishes between two effects: an exchange rate effect and a cash-flow effect. They show that exchange rate and cash flow effects would neutralize each other in the short run but would be complementary in the long run. Their conclusions could justify why empirical studies using data on a monthly basis fail in showing a link between companies' market values and exchange rates.

8. For that question, see for example Bodnar and Marston (2000) who analyzed US companies' exposure to exchange rate risks in relation to their income and costs flows priced in foreign currency. It results from their study that most of the companies they took into account are exposed to really low exchange rate risks. Indeed they may have regulated their income and costs in foreign currency. It results that these companies have a weak net exposure to exchange rate risks.

9. For that question, see Imbs (2003).

10. However the recent study by Heitz, Hild, and Monfort (2004) does not reach the same conclusion. Indeed it is only the connection between commercial and financial flows that has intensified.

11. The index used for the utilities sector came into effect in March 2001.

12. When several exchange rates are taken into account, it leads to problems of multicolinearity. That is why, in some papers, a weighted exchange rate has been used instead (Jorion (1990), Bartov and Bodnar (1994) as well as Choi and Prasad (1995) for example). Yet a weighted exchange rate does not necessarily show to what extent every single sector of activity is exposed to exchange rate risks.

13. There is today a renewed interest for the approach that was pioneered by Bry and Boschan in the 1970s and that Harding and Pagan followed (1999, 2003).

14. The approach adopted here logically differs from the standard least squares method whose aim is to determine the number of lags between endogenous and exogenous variables. As shown by Avouyi−Dovi and Matheron (2003), the notions of coincidence and correlation do not account for the same reality. As our approach mainly focuses on identifying monthly covariations, our purpose is not to identify specifically the time lags between phases that occur between the turning points of the two variables cycles.

15. The lags can be different from those evidenced by Berdot, Goyeau, and Léonard (2005) considering that they have been identified in relation to the US business cycle (and no longer in relation to the French business cycle). More specifically the sectors that sell much in the USA will be the first to benefit from the US economic recovery.

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APPENDIX
FTSE global classification system[*]

ECONOMIC GROUPS	SECTORS
RESOURCES	*Mining*
	Oil & gas
BASIC INDUSTRIES	Chemicals
	Construction & building materials
	Forestry & papers
	Steel & other metals
GENERAL INDUSTRIALS	Aerospace & defence
	Diversified industrials
	Electronic & electrical equipment
	Engineering & machinery
CYCLICAL CONSUMER GOODS	Automobiles & parts
	Household goods & textiles
NON CYCLICAL CONSUMER GOODS	Beverages
	Food producers & processors
	Health
	Personal care & household products
	Pharmaceuticals & biotechnology
CYCLICAL SERVICES	General retailers
	Leisure & hotels
	Media & entertainment
	Support services
	Transport
NON CYCLICAL SERVICES	Food and drug retailers
	Telecommunication services
UTILITIES	*Electricity*
	Utilities – Other
FINANCIALS	Banks
	Insurance
	Life insurance
	Investment companies
	Real estate
	Speciality & other finance
	Investment entities
INFORMATION TECHNOLOGY	Information technology hardware
	Software & computer services

[*] In italics: missing data in Datastream database.