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ABSTRACT

The present paper examines the determinants of investment activity in Greece over the period 1960-1999. It describes briefly the investment activity in Greece and then tests for the factors that presumably influence this investment activity. The paper uses a multiple linear regression model incorporating various factors that presumably influence investment activity in Greece, based on theoretical as well as on empirical evidence. The results confirm the anticipated positive relationship between investment and output, investment and profitability, and the anticipated negative relationship between investment and interest rate. Also, the first oil crisis and the incorporation of Greece in the wider EU financial area in 1992 seem to have influenced investment activity. Finally, the paper estimates investment elasticities with respect to the various factors, and makes some comments concerning the encouragement of investment activity in Greece.

JEL Classification: E22, E62, C20

Key words: investment, output, interest rate, profitability, crises, Greece

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1. INTRODUCTION

There are a number of reasons why investment plays an important role in an economy (Du Toit and Moolman, 2004, pp. 1-2): First, investment increases a country's productive capacity; second, investment expenditure induces shifts in the levels of employment and personal income by affecting the demand for capital goods; In the third place, investment, as part of the total expenditure of an economy, is substantially smaller than consumption but it often presents a much higher volatility, which causes serious fluctuations to economic activity. Meanwhile, investment is a very important determinant of the long-term improvement of an economy's competitiveness (Romer, 1996; Dornbusch and Fischer, 1990). Investment by firms may take many forms, such as training of employees, increase in fixed capital stock, etc. This last form of investment is the most crucial for both the firm and the economic future of the country in which the firm operates (Antonakis, 1987).

In the economic literature, there exist several approaches, which attempt to model investment behaviour. Therefore, theoretical, as well as empirical contributions, have resulted in a number of arguments and conclusions. On the other hand, the lack of a survey study aimed at presenting the current situation on investment decisions in a country like Greece becomes increasingly perceptible. The purpose of the present paper is *to identify the significance of specific factors in explaining the investment activity in Greece*.

The paper is organized as follows: The next (second) section discusses briefly the investment activity in Greece; the third section discusses the theoretical framework, i.e. the major factors influencing this investment activity; the fourth section presents the methodological framework, while the fifth part presents and discusses the empirical results. Finally, the last section concludes the paper.

2. INVESTMENT ACTIVITY IN GREECE: AN OVERVIEW

Gross Fixed Capital Investment (G.F.C.I.) in Greece, as a percentage of the Gross Domestic Product (G.D.P.), reached in 1994 its lowest level in the last three decades, after a period of continuous decreases, mainly due to the lack of investment incentives (Bosworth and Kollintzas, 2002). Meanwhile, profitability reached one of its lowest levels in the last decades as well, mainly due to the high growth rates of wages (Bosworth and Kollintzas, 2002; Tsaliki and Tsoulfidis, 1998), while the real interest rate was reaching its highest level. In the meantime, the European Union, as a whole, faced a similar situation, which has, however, been reversed in Greece, since 1995.

Insert Table 1

Demand, as expressed through G.D.P., is considered to be a major determinant of investment activity (Labour Insistute [L.I.], 2001). Thus, investment has closely followed the increasing trend of demand in the period 1960-1980, its decreasing trend in the time span 1981-1994 and again its increasing trend between 1995-1999, expressing the different phases that the Greek economy has been through so far

(Bosworth and Kollintzas, 2002; Dimeli et al, 1996; Alogoskoufis, 1995[1]). Meanwhile, the interest rate has shown a considerable decrease, increase and decrease respectively, in these periods, whereas the profit rate seems to be decreasing steadily (Maniatis et al., 1999).[2]

Statistical data of gross investment activity in machinery and equipment in the European Union (E.U.), has demonstrated that Greece lagged behind in growth rates in the period 1981-1986, but was slightly forging ahead between 1987-1995, and continues with considerably higher rates (12.4%) compared to the European Union for the time period 1996-2002 (European Commission [E.C.], 2000, 2001, L.I., 2001).

The considerable growth of machinery and equipment investment in Greece, compared to the other E.U. countries, has serious consequences on labour productivity (L.I., 2001). Except for Ireland (where the 10% yearly G.D.P. growth fuels labour productivity), Greece ranks first for the time period 1996-2002, with a growth rate of 2.8% together with Finland and Portugal (E.C., 2000, 2001, L.I. 2001). The major factor determining the growth of labour productivity, which, however, stimulates a raise in employment by only 0.9% yearly in the time span 1996-2002, is the continuous introduction of new production technologies, especially through Gross Fixed Capital Investment in machinery and equipment (L.I., 2001), compared to the past when the machinery, engineering and mainly the industrial sectors were barely developed and Greece ranked far behind the other European countries (Kintis, 1982).

This situation is enhanced by the fact that the share of investment in equipment, has risen from about 19% in 1960 to about 54% in 1994 (Kosmetatos,

[1] The study by Alogoskoufis (1995) on the Greek economy, does not focus on the significance of investment activity in Greece and is, generally, in contrast with the findings of Dimeli et al. (1996), Bosworth and Kollintzas (2002), and Tavlas and Zonzilos (2002).

[2] For details on the estimation of the profit rate see Maniatis et al. (1999). For sound empirical analyses on the (falling) rate of profit for the case of Greece see Tsaliki and Tsoulfidis (1998), Tsaliki and Tsoulfidis (1994), Tsaliki and Tsoulfidis (1993), Ioakimoglou and Milios (1993), Papadimitriou (1990), Lianos (1992). Also, for a very interesting analysis of the profit rate tendencies in Greece by sector, between 1962-1990, see Lianos and Droucopoulos (1993), Droucopoulos and Lianos (1993), and Christodoulopoulos (1996) for a similar analysis in other European countries. For a theoretical analysis of this issue see Milios et al. (2002), and for analyses in other

1996, pp. 2.32-2.33). Also, the share of investment in agriculture, fishing, forestry and mining has decreased since 1960, in favour of the industrial and service sectors (Kosmetatos, 1996; Papatheodorou, 1989, 1991; Kintis, 1982). For example, the investment share of Greek sectors 1 (agriculture, forestry, fishing) and 2 (mining) has fallen from 17.4% to 4.8% in 1994, while the investment share of the industrial sectors has risen from 9.9% to 18.0% between 1960 and 1994 (Kosmetatos, 1996, p. 2.33).[3]

It is obvious that the study of the factors that have an impact on investment may provide a better insight into the whole process of economic growth, and indicate those parameters, which could be influenced by policy measures aiming at fuelling the long-term growth of the economy on the one hand, and suppressing the rate of unemployment on the other.

3. THEORETICAL FRAMEWORK

This section provides a selective review of the various investment theories, emphasizing the factors that presumably have a significant impact on investment decisions.

One of the most important motivations to invest is considered to be the increase in output (Petraki-Kotti, 1996). The higher the income (and the production level) is, the more positive the firm's future expectations are, leading to increased investment decisions (e.g. Georgakopoulos et al., 1995; Katona, 1946; Shackle, 1949, 1955).

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countries see Maniatis (1996), Cockshott et al. (1995, 1996), Smith (1993), Shaikh and Tonak (1994), Freeman (1991) and Moseley (1991).

[3] For a brief analysis of the investment activity by sector in Greece, see Kosmetatos (1996), and for a more extensive but older survey study, see Kintis (1982). The data needed for a possible empirical investigation and estimation of the determinants of investment activity by sector in Greece are, at present, very limited and inaccurate (Bosworth and Kollintzas 2002, p. 198). Therefore, our investigation will be far more accurate and will yield more acceptable, general and comparable results if conducted on the macroeconomic level.

The simplest theory of investment demand is the "Rigid Accelerator Theory", formulated by Clark (1917).[4] This simplistic approach was rejected, right from the beginning, in tests by Kujnets (1935), Tinbergen (1938), Chenery (1952), Koyck (1954) and Hickman (1957). Next, a more elaborate approach was given by the "Flexible Accelerator Theory", originated by Chenery (1952) and Koyck (1954).[5] This theoretical model has been supported on grounds of empirical validity (Meyer and Kuh, 1957; Jorgenson, 1963; Jorgenson and Stephenson, 1967b). Continuously, Chenery (1952) and Koyck (1954) assumed that the level of desired capital is proportional to output. As a conlusion, we may say that probably the most "important implication of the accelerator models *is that the size of a firm's investment model is proportional to its output*" (Song et al., 2001, p. 229, emphasis added).

A careful examination of the empirical data, mainly for the American Economy, presented by Jorgenson (1971), Bischoff (1969), Bischoff (1971a), Evans (1967), Evans (1969), Griliches and Wallace (1965), Anderson (1964), demonstrated that output has, indeed, been one of the main determinants of investment. Also, Bosworth and Kollintzas (2002), based on their recent study for Greece, stated that the decline of investment performance had its roots in the deterioration of the macroeconomic situation in Greece, which was mainly reflected on output performance.[6] Also, Ligthart (2002) showed that the relationship between investment and output in Portugal was statistically significant in the under investigation period. Consequently, it is reasonable to assume that an increasing level of output influences positively the level of investment expenditure in the country.

[4] Investment is simply proportional to changes in output. This model considered only demand (and changes in demand) as determinant of investment behaviour, and did not necessarily come from a profit maximization objective.

[5] This mechanism was transformed into a theory of investment by adding a model of 'replacement investment' and a specification of the desired level of output. A simple model widely adopted for empirical work was that replacement investment is proportional to actual capital stock (Antonakis, 1987).

[6] For empirical evidence on the impact of macroeconomic policy on economic growth and development see Fischer (1993), Easterly and Rebelo (1993), and Collins and Bosworth (1996).

Continuously, an alternative specification is that investment is proportional to profit, because profit may be a measure of profit expectations (Tinbergen, 1938), while the rate of investment may be constrained by the supply of funds which, in turns, are related to profitability expected (Meyer and Kuh, 1957; Anderson, 1964; Meyer and Glauber, 1964).[7] This is the so-called "Liquidity Theory of Investment" (Antonakis, 1987) or, alternatively, the "Cash Flow Model" (Du Toit and Moolman, 2004).[8]

Thus, another important determinant of investment activity seems to be profitability. If firms are facing (or expect to face) a high level of profits, then the decision to undertake an investment will be positively influenced (e.g. Lianos and Mpenos, 1996). It is also obvious that if there is a decrease in profitability (or such a decrease is expected), the effect on future investment could be negative (e.g. Sarantidis, 1995). In other words, "firms with higher profits invest more" (Romer, 1996, p. 381) and, so we expect a positive relationship between the size of investment and profitability.

Studies by e.g. Bosworth and Kollintzas (2002), Maniatis et al. (1999) for Greece, and Fazzari et al. (1988), Hoshi et al. (1991), Lamont (1993), Dornbusch and Fischer (1990, ch. 9.2), Allen (1987), as well as older studies by Evans (1967), Jaffee and Russell (1966) and Anderson (1964) indicate that investment is, indeed, influenced by profitability. In other words, they "typically find a strong link between

[7] Grunfeld (1960) suggested that discounted future earnings less the costs of future additions to capital (i.e. a measure of expected earnings and not actual earnings) provide a good measure of expected profits. This is known as the "Expected Profits Theory".

[8] Tobin (1969) developed the so-called "*q* Theory", which constitutes a generalization of the "Cash Flow Model" in which investment expenditure is related to the ratio of market value of business capital assets to the replacement value of those assets. The ratio is known as Tobin's *q*. However, empirical analyses have resulted in the poor performance of "*q*-models" (Berndt, 1991). For a brief review of Tobin's "*q*-model" see Song et al. (2001, p. 230), and Du Toit and Mollman (2004, pp. 652-3).

cash flow [i.e. revenues minus expenses and taxes] and investment" (Romer 1996, p. 382).[9]

In general the models considered thus far, do not take explicit account of the factor prices (i.e. interest rate [Song et al., 2001, p. 230]) and are, therefore, not amenable to a discussion of the effect of investment incentives. The neoclassical theory of investment behaviour was considered as an alternative to the various investment theories. Its origins were found in the works of Roos and Von Sjeliski (1943) and Ross (1958). The theory was based on the assumption that the desired level of capital services is a function of relative prices. The cost of capital incorporated the rate of interest. The restatement of the Neoclassical Theory was expressed, in a couple of seminal papers, by Jorgenson and his associates.

The first serious attempt is in the seminal paper by Jorgenson (1963). The model came to be known as the "User Cost Model" of investment (Antonakis, 1987) and assumes that the investment model is *linear in prices and output* (Barbarino, 2003).[10] A few years later, Jorgenson and Stephenson (1967) also assumed that the aim of the firm is to maximise its Net Present Value and, after the relevant elaboration, they derived *investment in every period as a function of relative prices and output* (Antonakis, 1987). In this model, the investment function incorporated the role of profitability. [11]

Consequently, in a Keynesian framework (Milios et al. 2000, p. 415), the interest rate in the (domestic) market, as a measure of the cost of capital, should affect

[9] For a study on the interrelationships among profits, corporate investment and financing see Papadimitriou (1992).

[10] We will sketch, very briefly, the basic elements in the following: The firm solves for a maximization of the Net Present Value of the firm, given the law of motion for capital. The solution to this problem has First Order Conditions and assumes that capital adjusts immediately to the long-run 'optimal' level. For econometric implementation the above mentioned, ad hoc, investment function is assumed (Antonakis, 1987).

[11] Jorgenson and Stephenson (1967b) tested their theory by applying it to data for investment expenditures and the conclusion is that the theory provides a highly satisfactory explanation of actual investment expenditure, while the results of Jorgenson and Stephenson (1967, 1967b) emphasized the role of the cost of capital. Jorgenson and Siebert (1968) compared their theory of investment behavior with alternative ones and for any of the conventional measures of the goodness of fit, the performance of their theory was superior to that of the alternatives.

decisions to invest. The direction of this impact is well documented to be negative (see e.g. Dornbusch and Fischer, 1990, ch. 9; Milios et al. 2000, ch. 9) in the sense that, the lower the interest rate is, the higher the present value of the cash flows is. At the same time, interest rate, as part of the cost of capital, aggravates the profits of firms and therefore, given the fact that firms borrow to (partly) finance their investments, we may affirm the thesis that the lower the interest rate, the more favourable these acts of investment are.

Empirical studies, based on data mainly for the American Economy, have shown that the effect that the interest rate has on investment is statistically significant, however investment is inelastic with respect to interest rate (Petraki-Kotti, 1996). More specifically, Bischoff (1971a) summarises various studies on the subject and with the exception of one study conducted by Resek (1966), in all other six cases, investment was inelastic with respect to interest rate. Additional evidence about this negative, statistically significant but inelastic relationship can also be found in the studies of Bischoff (1971a, 1971b), Evans (1967), Griliches and Wallace (1965), Anderson (1964) and Mayer (1968) conducted in the U.S.A. and in Mprissimis, Magginas et al. (2002) for Greece. For more recent studies on the effects of monetary policy to investment behaviour of different types of firms, which however yield similar results, see Gertler and Gilchrist (1994), Mishkin (1995), Kashyap, Lamont and Stein (1994), Oliner and Rudebusch (1994).

Finally, the present paper, which analyzes the investment activity in Greece over a long period of time (1960-1999), identifies several other factors as important in explaining the investment activity in Greece. The data permit us to assess the possible impact of some important institutional and socioeconomic events on investment activity (Georgakopoulos et al*.,* 1995) in Greece. More precisely, the military rule that was in power during the period 1967-1974 is one of them. Meanwhile, the two oil

crises that have influenced negatively various sectors of the Greek economy (e.g. Milios and Ioakimoglou 1991a, 1991b) might have influenced negatively investment and industrial activity as well (Kintis, 1982, ch. 1). Finally, the country's incorporation in the E.U. financial area in 1992 is another very important event (Galiatsos and Papapetrou, 1995) that could have also influenced investment activity in Greece. The impacts of such events will be captured with dummy variables.[12]

4. METHODOLOGICAL FRAMEWORK

The methodological framework relies heavily on the analysis of the previous section (Section 3). According to economic theory and empirical analyses presented above, the main factors that presumably influence investment activity are: *output*, *interest rate* and *profitability*.

Consequently, our empirical model assumes that investment is linear to: *output* (see e.g. Georgakopoulos et al., 1995, p. 303; Lianos and Mpenos, 1996; Song et al., 2001, p. 229), *interest rate* (see e.g. Dornbusch and Fischer, 1993, p. 146) and *profitability* (e.g. Grunfeld, 1960, Song et al., 2001, p. 229).Furthermore, the model contains a constant term expressing the level of autonomous investment, i.e. the level of investment which does not depend on output, or any other factor (Dornbusch and Fischer, 1993, p. 146; Georgakopoulos et al., 1995, p. 303). In addition to the above, the constant term should be included, because omission of this term could bias the results substantially.

Thus, our analysis tests for the significance of the factors (i.e. output, interest rate, profitability), which presumably influence investment activity in Greece and

[12] At this point, we should note that researchers have often used time series techniques to forecast investment expenditure (e.g. Kopcke, 1982). Despite their satisfactory performance, time series models are seriously criticized for their lack of a theoretical economic framework which renders them of limited practical character for assessing policy changes on investment (Song et al., 2001, p. 230).

were pinpointed by the above analysis. Based on the above, the relationship is assumed to be linear, and we use a time-series data set for the period 1960-1999 when data are available.[13] The number of observations is 40 and the results of the regression (O.L.S.) demonstrated no evidence of serious or unexpected multicollinearity among the independent variables. So, in the basic specification, we use all of them simultaneously.

The estimation is based on the 'forward stepwise regression' as well as on the 'backward stepwise regression'. This analysis pinpoints the most important factor, explaining the higher percentage of the variability of investment, followed by the second most important factor (i.e. which enters the model second), explaining together a high percentage of the variability of investment, and so on. Also, the possible incorporation of the dummy variables in the model is expected to raise its goodness of fit to a highly satisfactory percentage.

Specifically, the basic model for estimating investment activity in Greece is:[14]

$$I_t = f(Y_t, r_t, \pi_t, M67, O1, O2, D92) + u_t$$

where:

I_t = Gross Fixed Capital Investment in Greece, in year *t*

Y_t = Gross Domestic Product in Greece, in year *t*

r_t = Real Lending Interest Rate in Greece, in year *t*

p_t = Net Percentage of Profit in Greece, in year t

M67 = Dummy variable for the military rule in Greece

O1 = Dummy variable for the first oil crisis

O2 = Dummy variable for the second oil crisis

[13] The variables could have, as well, been expressed in logs.

[14] Investment, in continuous time, produces and can be produced by output, since there is a reciprocal relationship between them. In this study, we regard investment as being fuelled and influenced by output, although an approach, where output is fuelled by new investment could also be accepted for the purposes of other studies.

D92 = Dummy variable for Greece in the E.U. financial area.

u_t = Disturbance Term designed to capture the effects of all other factors, which are not included in the model

f: Linear Function

5. EMPIRICAL RESULTS

5.1 The Data

The significance of the factors, which presumably influence the investment activity in Greece, is tested using data collected from various sources. The data is on an annual basis and covers the period 1960-1999.

Dependent Variable

- The dependent variable, investment in Greece, is measured through Gross Fixed Capital Investment. The data is drawn from *European Economy* (2000) published by the European Commission and is measured in billions of Greek drachmas at constant prices (1995 prices).[15]

Independent Variables

[15]Since accurate estimations of depreciation and amortization are not available, following Maniatis, Tsaliki and Tsoulfidis (1999) we came to the conclusion that if we eventually include them in our calculations, we will end up in more reliable results than the ones that would be extracted if we subtracted depreciation on the basis of certain *ad-hoc* estimations.

- The Gross Domestic Product of Greece, at constant prices (1995 prices), is obtained from *European Economy* (2000) published by the European Commission and is measured in billions of Greek drachmas.
- The Real Lending Interest Rate (%) for trading capital is obtained from the *Statistical Bulletin* of the Bank of Greece and *European Economy* (2000) published by the European Commission.
- The Net Percentage of Profit (%) is obtained from the survey study by Maniatis et al. (1999).
- A dummy variable that takes the value of 1 during the military rule and 0 elsewhere, and is used to account for the military rule in Greece.
- A dummy variable that takes the value 1 during the crisis and 0 elsewhere, and is used to account for the first oil crisis.
- A dummy variable that takes the value 1 during the crisis and 0 elsewhere, and is used to account for the second oil crisis.
- A dummy variable that takes the value of 0 before 1981 and 1 afterwards, and is used to account for the country's incorporation in the E.U. financial area.

5.2 Estimates of the Investment Model

Table 2 presents regression results for each of the dependent variables. The signs of the estimated coefficients are consistent with the stated hypotheses and are statistically significant for all variables, except for the dummy variables accounting for the military rule in Greece and the second oil crisis.

Insert Table 2

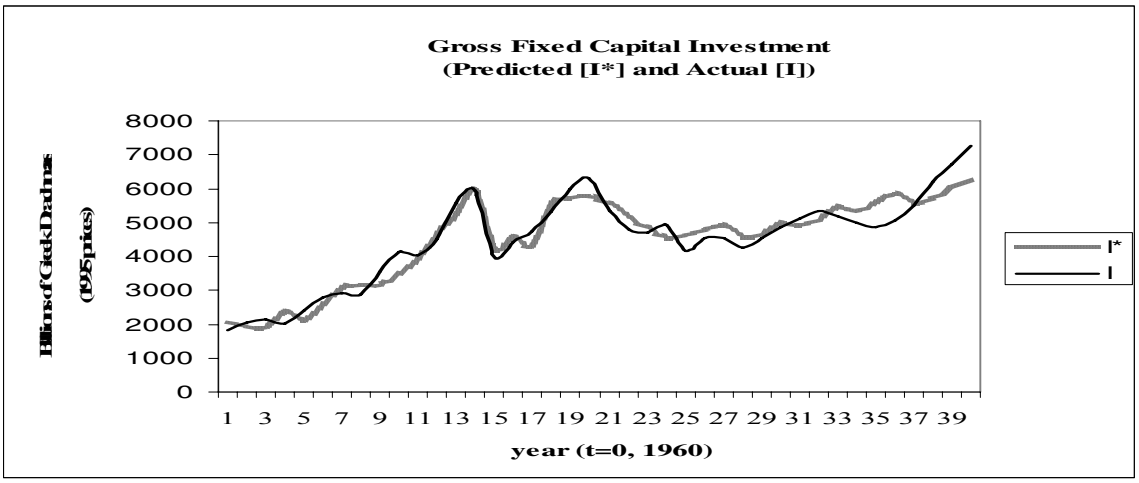
The variables accounting for the military rule in Greece and the second oil crisis have insignificant coefficients and are, therefore, omitted. Table 3 presents the new regression results for each of the dependent variables.

Insert Table 3

The estimation is based on the 'forward stepwise regression'. However, it should be noted that the 'backward stepwise regression' yielded identical results. The most important factor, explaining a high 78% of the variability of investment, is output, followed by profitability which enters the model second, explaining together a high 87% of the variability. Continuously, the incorporation of the dummy variables, O1, D92 and the interest rate in the model raise its goodness of fit to a very high 91%.

The signs of the estimated coefficients are consistent with the stated hypotheses and are statistically significant for *all* variables. The regression explains a very high 91% of the variability of the investment activity in Greece. Also, a constant term is included, because omission of this term might bias the results substantially. Figure 1 shows actual and estimated Gross Fixed Capital Investment in Greece.

Figure 1. Predicted and Actual Values of Gross Fixed Capital Investment



A matter of great interest is the change in investment expenditure as a result of the change in output, in interest rate and in profit rate respectively, while the other independent variables remain constant. Thus, we are interested in the elasticity of investment. Table 4 presents the average elasticity of investment, with respect to the independent variables.

Insert Table 4

As expected, the signs of the determinants of investment are consistent with economic theory and literature. This means, that the anticipated positive relationship between investment and output, as well as between investment and profitability, is confirmed empirically. Similarly, the anticipated negative relationship between investment and interest rate is also confirmed empirically.

We also note that the dummy variable accounting for the impact of the first oil crisis on investment activity in Greece is negative and significant, and consistent with the analysis of Tavlas and Zonzilos (2002) about the Greek economy, and also consistent with the analysis of Milios and Ioakimoglou (1991a, 1991b), and Thanopoulou (1994) who comment on the negative impact of such a crisis on others sectors of the Greek economy. Finally, our findings about the Greek economy are also consistent with the findings of Kintis (1982, p. 31) that the Greek economy, until the late 70s, has been "sensitive to the fluctuations of economic activity worldwide".[16]

Similarly, the dummy variable accounting for the country's incorporation in the E.U. financial area is positive and significant, and indicates that such a regulatory change has encouraged investment, because it created a new strict and favourable

framework for banking and monetary authorities (Garganas and Tavlas, 2002) – as described by Papademos (1992) – and, as a result for investment activity (Krystalloyanni, 2000; Galiatsos and Papapetrou, 1995), since the financial system has important effects on investment (and growth) and on the quality of the investment projects that are undertaken (King and Levine, 1993a, 1993b; McKinnon, 1973).

Based on the estimated elasticities, it is evident that output, profitability and interest rate are, in order of importance, the three major factors influencing investment activity in Greece. This conclusion is also supported by the results of the stepwise regression, which indicated the same three factors, in the same order of importance, as the most important variables in explaining the variability of investment behaviour. Finally, this conclusion is also consistent with the range of the t-statistic of the three variables indicating, for once again, the same variables, in the same order of importance, as the major factors influencing investment behaviour.

6. CONCLUDING REMARKS

The elasticity of investment with respect to output is 1.592, which means that for an anticipated 1% increase in output, investment will increase by an average of 1.592%. It is obvious, that investment is elastic with respect to output. The elasticity of investment with respect to the real interest rate is -0.028, which means that for an anticipated 1% decrease in the real interest rate, there will be an average increase of 0.028% in investment. Consequently, investment is non-elastic with respect to interest rate, so a change in interest rate will practically have no effect on investment. Finally, the elasticity of investment with respect to profitability is 0.825, which means that for

[16] For a recent study and a comparative analysis regarding similar to Greece economies, i.e. Ireland, Spain and Portugal, see Bosworth and Kollintzas (2002). Also, for an empirical analysis of capital investment and output growth, for the case of Portugal, see Ligthart (2002) and Pina and Aubyn (2003).

an anticipated 1% increase in profitability, there will be an average increase of 0.825% in investment. Thus, investment is non-elastic with respect to profitability.

Consequently, if the Greek government wishes to stimulate investment activity in the economy, in order to increase further the country's productive capacity, to induce shifts in employment and make an attempt to control the volatility, which causes serious fluctuations to economic activity, should try to have under control the following factors, in order of importance: *output, profitability, and interest rate*.

This point raises questions for further research:

More specifically, this point refers to the efficacy of monetary and fiscal policies. We know that monetary and fiscal policies may influence investment behaviour. On the one hand, as is well known, fiscal policy has an influence on investment behaviour through two major factors: firstly through profit taxation, and secondly through investment taxation. Both these factors ultimately influence a firm's profitability. On the other hand, monetary policy may have a significant and systematic impact on investment in various ways[17] (and the foremost through the direct determination of interest rate. The question rising at this point is the: *To what extent were the monetary and fiscal policies able to create investment incentives?*

We have seen that the effect of interest rate on investment was almost imperceptible, since a 1% change in the interest rate caused a 0.028% change, of opposite direction, in investment. Therefore, the effect of interest rate was practically imperceptible. On the other hand, we have seen that a 1% change in profitability caused a 0.825% change in investment.

Consequently, *the attempt to create investment incentives through the adjustment of the interest rate would be almost ineffective*, or to be more precise, vast changes in that factor would be required, so that very small changes in investment

expenditure could follow. On the other hand, *the effect of profitability on investment is, as seen, non-elastic but considerably larger than that of interest rate*. Consequently, *fiscal policy, mainly through taxation, seems to be a more effective instrument than monetary policy, in the Greek government's hands for the 1960-1999 time span*.[18]

To recapitulate, we may say that the purpose of this study was to examine the determinants of investment in Greece over the 1960-1999 time span. Major factors have been chosen, which, according to economic theory and empirical studies could explain investment behaviour.

The results showed that some of these factors, i.e. the output level, the interest rate, the profit rate, the first oil crisis and the country's incorporation in the E.U. financially, had some empirical validity for Greece. The signs of the estimated coefficients were consistent with the stated hypotheses and statistically significant, while the regression explained 91% of the variability of investment activity in Greece.

More precisely, output played a statistically significant role in the determination of investment, since for every 1% change in output, there was a 1.592% change in investment expenditure. Meanwhile, the influence of interest rate on investment was statistically significant as well, yet practically imperceptible, since a

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[17] See Gertler and Gilchrist (1994); Kashyap et al. (1994); Oliner and Rudebusch (1994) and for Greece Moschos and Zonzilos (1996); Kastrisianakis and Mprissimis (1997).

[18] Another explanatory (dummy) variable, foreign direct investment (F.D.I.) in Greece, which reflects the country's incorporation in the E.U. (Bosworth and Kollintzas, 2002, p. 212), might have been added to the basic model to assess its contribution. However, the available data are seriously flawed (Galiatsos and Papapetrou 1995; De Santis et al., 2001). First, the data overestimate seriously the volume of the F.D.I. because there is no limit in the participation in the share capital, below which a portfolio investment is not regarded as F.D.I. Second, there is an additional serious underestimation of the F.D.I. in Greece, because the loans between the parent company and the affiliate, are not considered as F.D.I. Consequently, following Galiatsos and Papapetrou (1995, p. 71, fn. 8) we decided not to try it, since "all these deficiencies in the variable make the use of that variable for measuring F.D.I. in Greece less than accurate" and, thus, a possible incorporation of it into the model – even if its contribution proved to be significant – could cause very serious flaws and deficiencies to the model. Similarly, De Santis et al. (2001, p. 17), in their respective analysis on F.D.I., consider "thirteen F.D.I.-receiving countries […] with the exclusion of Greece, as there are no homogeneous data". Finally, the analysis of Helliwell (2002) and the findings of Bosworth and Kollintzas (2002) that the capital inflows from abroad were significant only during the 90s, and that the F.D.I., during that period, remained constant to 1% of G.D.P., makes it extremely improbable that F.D.I. could have had any significance for explaining competitiveness and growth and, consequently, investment activity in Greece (Bosworth and Kollintzas, 2002, p. 212) over the expanded 1960-1999 time span. Bosworth and Kollintzas (2002, p. 212) wrote: "We come to the conclusion that the incorporation [of Greece] in the E.U. has not

1% change in the interest rate caused a 0.028% change, of opposite direction, in investment. Finally, the effect of profitability was also statistically significant. Every 1% change in the profit rate caused a 0.825% increase to investment.

Our findings are interesting for understanding the development of investment activity in Greece and could have significant policy implications in this country. Clearly, future research would be of great interest.

As a final conclusion, we may say that, although an empirical investigation cannot establish a new theory, a generally accepted and reliable approach to investment should include the determinants mentioned above. We believe that some theoretical and empirical analyses have been proven superior to others due to their general character, i.e. their ability to take into consideration a multiplicity of factors.

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exercised any significant […] influence on the competitiveness and, thus, on the development dynamics of the Greek economy".

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Tables

Table 1. Gross Fixed Capital Investment in Greece, 1960-1999 (selected years)

Year	G.F.C.I. (bn. drachmas.)	G.D.P. (bn.drachmas)	G.F.C.I. (%G.D.P.)	Real Interest Rate	Profit Rate
1960	1808.8	6753.2	0.27	0.059	0.261
1965	2774.8	10401.4	0.27	0.053	0.227
1970	4040.4	1524.7	0.26	0.050	0.211
1975	4417.6	19509.6	0.23	-0.019	0.214
1980	5332.4	23931.2	0.22	-0.039	0.138
1985	4552.5	24081.1	0.19	0.012	0.110
1990	5109.1	25598.7	0.20	0.071	0.100
1994	4861.5	26674.8	0.18	0.167	0.105
1999	7270.6	30950.5	0.23	0.056	0.054

Sources: *European Commission, Greek Ministry of Economics, Bank of Greece, Maniatis, Tsaliki and Tsoulfidis (1999) (1995 prices).*

Table 2. Regression Results on the Determinants of Investment in Greece, 1960-1999

Independent Variables	*Estimate*	*t-statistic*
Constant	-5713.680	-4.169*
Y_t	0.342	9.619*
r_t	-32.283	-1.739**
p_t,	214.397	4.990*
M67	187.065	0.858
O1	-1103.460	-3.200*
O2	-52.690	-0.216
D92	458.95	1.786**
R^2	0.91	
S.E.E.	426.573	
F-Ratio	49.15	

Notes: * Significance at the 1% level

**Significance at the 10% level

Table 3. Final Regression Results on the Determinants of Investment in Greece, 1960-1999

Independent Variables	*Estimate*	*t-statistic*
Constant	-6289.440	-5.204*
Y_t	0.354	11.047*
r_t	-31.800	-1.953**
p_t,	235.715	6.551*
O1	-1137.870	-3.200*
D92	498.628	2.025*
R^2	0.91	
S.E.E.	419.607	
F-Ratio	70.92	

Notes: * Significance at the 1% level

**Significance at the 10% level

Table 4. Elasticity of Investment

Coefficient	*Formula*	*Estimate*
ε_{IY}	$\frac{\partial I}{\partial Y} \bullet \frac{Y}{I}$	1.592
ε_{Ir}	$\frac{\partial I}{\partial r} \bullet \frac{r}{I}$	-0.028
ε_{Ip}	$\frac{\partial I}{\partial p} \cdot \frac{p}{I}$	0.825