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## ARTICLE

# Psychological barriers in stock market indices: Evidence from four southern European countries

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**Abstract** In this paper we examine, for the first time, the major stock market indices of Greece, Italy, Portugal, and Spain for indication of psychological barriers at round numbers. Uniformity in the trailing digits of the indices was tested, and regression and GARCH analysis was used to assess the differential impact of being above or below a possible barrier. No evidence of psychological barriers was detected in the Italian stock market. There was weak evidence of barriers in the Iberian stock markets, and a strong indication of psychological barriers in the Greek stock market. Moreover, it is shown here that the relationship between risk and return tends to be weaker at the proximity of round numbers, which poses a challenge to the traditional equilibrium models.

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### Barreras Psicológicas en Índices Bursátiles: Evidencia de Cuatro Países de Europa del Sur

**Resumen** En este artículo se examina por primera vez los principales índices bursátiles de Grecia, Italia, Portugal y España en busca de evidencia de barreras psicológicas en números redondos. Hemos probado la uniformidad de la distribución de dígitos de los índices y hemos usado regresiones y análisis GARCH para evaluar el impacto diferencial de estar por encima o por debajo de una posible barrera. No se detectó ninguna evidencia de barreras psicológicas en el mercado bursátil italiano. Existe evidencia poco sólida de barreras en los mercados ibéricos y una fuerte indicación de barreras psicológicas en el mercado griego. Además, se muestra que la

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relación entre el riesgo y la rentabilidad tiende a ser más débil en la proximidad de los números redondos, lo cual plantea un reto a los modelos de equilibrio tradicionales.

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## 1. Introduction

Market practitioners and journalists often refer to the existence of psychological barriers in stock markets. Many investors believe that round numbers serve as barriers, and that prices may resist crossing these barriers. Moreover, the use of technical analysis is based on the assertion that traders will “jump on the bandwagon” of buying (selling) once the price breaks up (down) through a “psychologically important” level thus suggesting that the crossing of one of these barriers may push the prices up (down) more than otherwise warranted. Frequently used phrases by the business press such as “support level” and “resistance level” imply that, until such time as an important barrier is broken, increases and decreases in the prices may be restrained.

The impact of such kind of psychological barriers in investors’ decisions has been studied since the 1990s for a variety of asset classes, from exchange rates with [De Grauwe and Decupere \(1992\)](#) to stock options with [Jang et al. \(2015\)](#). The evidence of psychological barriers on stock market indices suggests some significant impacts of this phenomenon in the returns and variances in different geographies and periods (e.g., [Donaldson and Kim, 1993](#); [Koedijk and Stork, 1994](#); [Cyree et al., 1999](#); [Bahng, 2003](#)).

This article examines the existence of psychological barriers at round numbers in the major stock market indices of four Southern European countries: Greece (FTSE/ATHEX Large Cap), Italy (FTSE MIB), Portugal (PSI 20) and Spain (IBEX 35). To the best of our knowledge, none of these markets has ever been analyzed with this purpose. And their economic significance is not negligible: the four national stock markets accounted in 2012, in aggregate, for about a third of eurozone’s GDP and almost a quarter of eurozone’s total stock market capitalization ([World Bank, 2014](#)).

The anchoring effect, a well-known behavioral bias firstly identified by [Tversky and Kahneman \(1974\)](#), is the main explanation for the existence of psychological barriers in financial markets. Individuals, when performing an estimation in an ambiguous situation, tend to fixate (“to anchor”) on a salient number even if that number is irrelevant for the estimation. The anchoring on round numbers is important for its great explanatory power of some of the features commonly associated to financial markets. It may help to understand, for example, the excessive price volatility ([Westerhoff, 2003](#)), the momentum effect ([George and Hwang, 2004](#)), or even the emergence of speculative bubbles ([Shiller, 2015](#)).

Of course, behavioral biases are not the only reason why barriers could exist. For example, the fact that option exercise prices also are usually round numbers may be an additional explanation for the phenomenon.

The existence of psychological barriers contradicts the efficient market hypothesis as it points to some level of predictability in stock markets and thus may lead to abnormal risk-adjusted returns. Hence empirical evidence for the existence of psychological barriers is not only of interest to practitioners who are looking for profitable strategies but it also represents a contribution to the literature on market efficiency and on market anomalies.

Our methodology comprises a number of empirical tests. We test for uniformity in the trailing digits of the stock indices and use regression and GARCH analysis to assess the differential impact of being above or below a possible barrier. The results obtained reveal substantial differences in the incidence of psychological barriers on the markets of the sample. In the Italian stock market, it was not detected any evidence of psychological barriers. There is weak evidence of barriers in the Iberian stock markets. Lastly, the Greek stock market is the one with the strongest indications of psychological barriers nearby round numbers. Moreover, we show that the relationship between risk and return tends to be weaker at the proximity of round numbers, especially in short time horizons (up to five days).

This article is organized in as follows. Section 2 reviews the empirical evidence regarding psychological barriers. Section 3 presents the data and methodologies used in this paper. Section 4 presents the empirical results. Section 5 offers conclusions.

## 2. Previous findings

[Donaldson \(1990a, 1990b\)](#) and [De Grauwe and Decupere \(1992\)](#) were the first to study the phenomenon of psychological barriers and showed that round numbers are indeed of special importance for investors in the stock and in the foreign exchange markets, respectively. From then on, several other studies followed, focusing not only on different geographies and periods, but also on different asset classes, such as bonds, commodities and derivatives.

To date, stock indices have been the target of most research concerning psychological barriers. [Donaldson \(1990a, 1990b\)](#) used both chi-squared tests and regression analysis to test for uniformity in the trailing digits of the Dow Jones Industrial Average (DJIA), the FTSE-100, the TSE, and the Nikkei 225. His findings rejected uniformity for all but the Nikkei index.

[Donaldson and Kim \(1993\)](#) examined the DJIA for the period 1974–1990 using a Monte Carlo experiment and found evidence confirming round numbers (100-levels) as support and resistance levels. Furthermore, they concluded that once such levels were crossed through, the DJIA moved up or down more than usual in what they called a “bandwagon

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