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The Impact of Monetary Policy on the Mutual Fund Flow-Performance Relationship: International Evidence

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Resumo

Neste estudo utilizamos dados de 36 países no período 2000-2015 para avaliar o impacto da política monetária na relação entre fluxo e desempenho. Constatamos que aumentos (diminuições) consistentes das taxas de política monetária resultam em saídas (entradas) de fundos de investimento em ações. Verificamos também que o impacto da política monetária na sensibilidade ao desempenho dos fluxos é escasso. No entanto, os resultados para os mercados offshore sugerem que os investidores tendem a vender mais fundos com pior desempenho quando a taxa de política monetária diminui. Em contrapartida, nos períodos em que a política monetária se torna mais restritiva, os investidores em fundos de investimento europeus tendem a comprar menos fundos de investimento com melhor desempenho.

Verificamos também que, em períodos de maior volatilidade e períodos de diminuição da taxa de política monetária, os investidores tendem a reagir mais (menos) aos melhores (maus) desempenhos. Assim, nestas circunstâncias, a política monetária demonstra ser um fator determinante da convexidade da relação fluxo-desempenho.

Abstract

In this study we use data from 36 countries in the 2000-2015 period to assess the impact of monetary policy on the flow-performance relationship. We find that consistent increases (decreases) in policy rates results in equity mutual funds outflows (inflows). We also find that the impact of policy on the flow-performance sensitivity is scarce. Nevertheless, the results for offshore markets suggest that investors tend to sell more poor performers when policy rate decreases. Contrarily, in periods when monetary policy tightens, investors in European mutual funds tend to buy fewer top performers.

We also find that in periods of higher volatility and periods of decrease in the policy rate, investors tend to react more (less) to top (poor) performers. Hence, in this circumstances, monetary policy is a key determinant of the convexity of the flow-performance relationship.

Keywords: Mutual Funds, Flow-Performance Relationship, Monetary Policy, Business Cycles.

JEL Classification: G15, G23

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1. Introduction

The flow-performance relationship in equity mutual funds, the industry we analyze, has been deeply studied for more than 40 years. Some studies analyze the impact of past performance on mutual flows across different economic and financial scenarios (see, for example, Chevalier and Ellison, 1997, Sirri and Tufano, 1998, and Huang, Wei and Yan, 2007). Their results, however, are mixed, which is most likely due to the different periods of time considered in their studies, as we will further develop in this paper. Additionally, these studies do not focus on the impact of different economic periods and monetary policies on the flow-performance sensitivity. There is, therefore, room for a more comprehensive and in-depth study of the potential effects of different economic periods on the flow-performance relationship of actively managed equity funds.

According to the Investment Company Institute (ICI), since 1999 until 2016 there was an increase of 289% in the total assets managed by mutual funds, which represents in absolute terms an increase of $30 trillion, when comparing to the net asset value of $10,4 trillion in 1999. Thus, it is plausible to infer that the mutual fund industry has gained visible importance over the past years, not only in the U.S. market, where at the beginning of 2017 more than 55 million households owned mutual funds (ICI, 2017) but also in other countries such as U.K., Canada, France, Ireland, and Japan.

Given the continuous increase of the equity mutual fund industry, one could argue about its possible systemic relevance for the economy. Thus, we believe that the impacts of monetary policy on the flow-performance relationship of mutual funds are important to be ascertain. Besides, the 2007-2008 financial crisis showed that, through the looseness of the monetary policy, several actions were taken with the purpose to stimulate economies. Hence, this situation generates further motivation to investigate its impact on the relation between inflows/outflows and performance of equity mutual funds.

In fact, policy makers and market participants share a growing concern about the impacts of monetary policy on the mutual fund industry, and, therefore, the effects on the investors wealth and financial stability. Nevertheless, and as studied by Banegas, Monte-Rojas and Siga (2016), we recognize that nowadays market expectations and reactions towards the stance of monetary policy is heavily addressed by the central banks forward-looking guidance policy. However, we do not explore that topic in this study.

Therefore, the aim of this paper is to study the link between the monetary policy and the flow-performance relationship of equity funds. To do so, we first investigate the flow-performance relationship across countries. Subsequently, we use policy rates[1] across countries to see if their impact on the flow-performance relationship of funds is significant. Moreover, we expect that, while considering different performance quintiles, the impact will be non-linear. Finally, we use data from the Organization for Economic Co-operation and Development (OECD) to identify different business cycles and the VIX

[1] Key interest rate determined by a central bank.

index to proxy for high levels of volatility (extreme market fears). We then aim to explain the role of monetary policy in the flow-performance relationship when facing distinct economic realities. However, one could argue about the possibility of divergent results on countries at various stages of economic development and financial development. Hence, we use proxies for country-level variables related to regulation, development and competition of the mutual fund industry to assess whether these interfere with the explanatory power of monetary policy on the flow-performance relationship.

We believe that our investigation can, not only have an incremental contribution to the existent literature, but also be deemed relevant to both investors and regulators. There are several studies relating monetary policy to flows of bond mutual funds (see, e.g., Goldstein, Jiang and Ng, 2017, and Feroli *et al.*, 2014), but the literature relating monetary policy to equity mutual funds is scarce. By using a database that includes data from more than 30 countries, investors will have a more conclusive empirical evidence as the results for larger countries like the U.S. may not translate to other countries at distinct stages of development. Therefore, not only both comparative interpretation and examination may be clearer to investors, but also the acknowledgement of how monetary policy works and how deeply it can affect financial markets could be enhanced. Also, regulators will have a broader range of results to reflect on and to better understand whether the mutual fund industry is or not a relevant vehicle for the transmission of the monetary policy.

2. Literature Review

This section presents the literature review. While there is a large number of studies trying to explain the different features of the equity mutual fund industry, most papers are focused on the U.S. fund industry.

2.1. *Fund performance*

Performance persistence is one of the most studied issues in the mutual fund literature. Most authors investigate whether there is a managerial ability to pick winner stocks, or if it is attributable solely to luck, in other words the "hot hands" effect (Hendricks, Patel and Zeckhauser, 1993), which leads to obvious controversy about the reasons behind performance persistence. In one hand, Hendricks, Patel and Zeckhauser (1993) and Wermers (1997) find that funds' performance persistence is restricted to shorter periods, normally no more than one year. In the other hand, Grinblatt and Titman (1992) provide results suggesting that performance persists for longer periods that can go up to 5 years.

Another hot topic is the level of risk-taking by fund managers and its reaction to several determinant key variables. Moreover, one should take into consideration the outcome surrounding this field of study, since for managers and their level of risk-taking strategies

it is important to be noted. Hence, it conveys various sources of information for managers to shape their strategies according to the best interest of investors.[2]

Notwithstanding, other relevant literature has been developed throughout the years concerning mutual fund performance (see Jegaadeesh and Titman, 1993, Gruber 1996, Carhart, 1997, Berk and Green, 2004, and Ferreira et al., 2013).

2.2. *Fund flows*

Due to the importance of flows into and out of equity mutual funds, the empirical work has been tailored in various areas. Its implications are of utmost relevance for both mutual fund investors and fund managers, helping them to rearrange their investment strategies in accordance to the vast set of key determinants shaping mutual fund flows.

Through the analysis conducted in this subject, one can easily find empirical evidence on that matter, from the investor perspective. There are a set of variables that are important to be mentioned, including fund level characteristics, such as (i) fund age, (ii) fund fees, (iii) family size, (iv) expenses, (v) the number of countries where the fund is sold, and (vi) the rating of the fund provided by Morningstar. Nanda, Wang and Zheng (2004) shows that funds labeled as a star within a fund family tend to generate positive inflows for the whole family.

While acknowledging the existence of other relevant literature studying equity fund flows (See Del Guercio and Reuter (2014), Song and Wilhelmsson (2014) and Banegas, Monte-Rojas and Siga (2016) for a deeper comprehension about the flows into and out of equity mutual funds), the main subject of our investigation is the response of flows to past performance. We therefore present some of the most relevant literature on the flow-performance relationship.

2.3. *The flow-performance relationship*

The empirical investigation on the flow-performance relationship has a determinant impact on the decision-making process of mutual fund investors. In fact, in previous research, capital allocation into mutual funds has been empirically explained by past performance.

The existent literature focus on (i) datasets covering different countries and time periods, (ii) explanatory variables, and (iii) studies with direct impact on our research project.

i) Countries and time periods

Recently, due to the overall growing of mutual fund industries all over the world, there are important studies regarding equity mutual fund flow-performance relationship using a worldwide universe. Nonetheless, it is in the U.S. where the investigation in the mutual

[2] For a more in-depth consideration tackling the risk-taking level of mutual funds and its key determinants, see Chevalier and Ellison (1997), Li, Griffin, Yue and Zhcuo (2013) and Kim (2017).

fund industry and its key determinants is more pronounced. For instance, Ippolito (1992) analyzes the reaction of consumers to new information about investment management market quality in the U.S. mutual fund industry. Wermers (2003) uses U.S. data to construct holding-based measures of momentum-investing behavior, to study performance persistence, flows and fund managers behavior. These are important studies for the mutual fund industry. Notwithstanding, most of them investigates the U.S. industry, which leads to rather narrowed conclusions.

More recently, researchers have looked at other countries, where the mutual fund industry has been increasing in value and economic importance.[3] Moreover, other studies have been focusing on international data for a broader analysis. Ferreira *et al.* (2012) use a global sample to investigate the effects of fund-level and country-level characteristics on the performance of mutual funds and its influence on funds capital allocation and find different results across different countries. Li (2017) uses a worldwide sample of equity mutual funds and finds evidence of increasing sensitivity of flows to past performance for funds established in less developed countries.

ii) Explanatory variables

Different studies show that in more sophisticated markets there is an increase in the responsiveness of fund flows to historical performance for larger fund families. This, in turn, makes investors to retain more past losers than past winners (Liu, 2018). On the other hand, Keswani et al. (2019) study the impact of investors' culture on the shape of the flow-performance relationship.

There are some seminal studies on this subject. First, Chevalier and Ellison (1997) uncover signs of incentives from portfolio managers to alter risk-taking strategies in the last part of the year with the expectation to achieve abnormal positive returns and subsequently get more inflows. These results are found, particularly, in younger funds due to their "gamble" culture towards the end of the year.

Second, higher or lower marketing expenses, in other words the extent of fees charged, have been widely studied and deemed to have a direct impact on fund performance and, from that, having also an effect on fund flows. Sirri and Tufano (1998) study marketing expenses to provide evidence of a steeper relation between flows and prior performance in funds allocating more resources towards media attention, which, in turn, results in a decrease of search costs for investors.

There are also expectations for the expenses incurred to impact the decision-making of investors, preceding the decision of capital allocation towards a given fund. Huang, Wei and Yan (2007) use: a) information costs and b) transaction costs as a proxy for participation costs – i.e., the price tag incurred by investors prior to their decision of investing in a fund – and find evidence of reduced sensitivity for former winners when

[3] Cai, Chan and Yamada (1997) study Japanese mutual funds; Blake and Timmerman (1998), U.K.; Italian funds are studied by Cesari and Panetta (2002); and, European funds are studied by Otten and Bams (2002).

participation costs are low and for a stronger sensitivity in the middle range of the performance distribution.

As already mentioned above, these studies have a significant impact for the decision-making process, namely for the investment strategies followed by the fund managers. Also, there is a direct link between investors behavior, when it comes to allocate capital, and the strategies followed by the portfolio managers. First, equity funds inflows or outflow will shape the fees charged by those funds. Second, managers increase risk-taking due to the expectation that chasing performance might be encouraged by the convex shape of the flow-performance relationship (see, e.g., See Lakonishok et al., 1991, Chevalier and Ellison, 1997, and Li, Griffin, Yue and Zhcuo, 2013). Finally, when analyzing flows reaction to past performance it also matters to account for the existence, or not, of performance persistence over time, which helps managers to delineate their investment strategies.

iii) Studies with Direct Impact on our Research Project

There is a set of studies that are more closely related to our study. This includes Ferreira *et al.* (2012) as they use a world-wide survivorship bias-free sample from the Lipper Hindsight Database to study the flow-performance relationship.

As for the monetary policies implications on the flow-performance relationship, we will focus on the results of Banegas, Monte-Rojas, and Siga (2016). While using different methodologies to proxy for shocks in monetary policy, this study finds persistent outflows in funds when an unexpected rise in the federal funds rate (FFR) occurs. To achieve their conclusions, they put on trial several approaches to determine which one best represents the unexpected shocks[4].

There are other studies, while not directly analyzing the effects of monetary policy on the flow-performance relationship, that are worth to be mentioned. These are related to the economic theory concerning the impacts of monetary policy on equity markets. To better illustrate the relevance of this topic we will present some studies, which will be taken into account to support further our empirical findings. It is widely accepted by economic community that movements to the policy rate will have contrary effects on equity and bond markets. If we, for example, consider a hypothetical increase to the policy rate (tightening), we expect that to have a negative impact on equity prices. In turn, bond market yields will be positively affected, especially for shorter maturities. An example of that is the study of Rigobon and Sack (2004) where they show that an increase in the policy rate results in a decline of prices in equity markets. In turn, and related to this, yields shift upwards. Noticeably, they use the event-study method, together with high-frequency data, which can be summarized as an extreme case of heteroskesdacity-based estimator used to assess the variance of policy shocks and its effects in stock prices. Likewise, there are other studies providing the same qualitative judgement about the

[4] One of the those is the well-known structural Vector Auto Regressive model designed by Christiano, Eichenbaum and Evans (1996).

short-term impacts of policy rate setting on stock prices. While using structural VAR methodology to simulate monetary policy shocks, Bjornland and Leitemo (2009) also find a decrease on stock prices by 7%-9% following a monetary policy shock raise of 100 basis points.

Nonetheless, more recently, monetary policy makers had to adapt their tools in order to face the recent financial and economic crisis. With that in consideration, they were forced to introduce unconventional monetary policy strategies, others than the policy rate[5], to guarantee the compliance of their monetary stability mandate. This recent innovation, in respect of the broadness of the toolkit for the application of the monetary policy, has not been analyzed in detail by researchers, at least in the mutual fund industry context. As for the VAR model, earlier introduced, it does not consider those unconventional tools built to stimulate real economy when policy rates were not enough to assure that. Following that, Burachi, Carnelli and Whelan (2014) use monthly data from Blue Chip Financial Forecasts and Blue Chip Economic Indicators surveys – which identifies future expectations for some key economic features – to build a proxy for monetary policy shocks through the application of the Taylor Rule. However, these surveys are focused on the U.S. and there is no evidence that other countries have also developed this kind of forward-looking approach.

In summary, there are not many studies investigating the impact of monetary policies on the flow-performance relationship. Focusing on the U.S. fund industry, Jesus (2017) shows that monetary policy is a key determinant to explain the asymmetric relationship between flows and past performance. While using the methodology constructed by Huang, Wey and Yan (2007), the study also accounts for the highs and lows of the policy rates and show how the flow–performance relationship reacts to that. Ultimately, he shows that an increase in the federal funds rate (hereafter, FFR) leads to a reduction of flows to top performers by 19% and by 26% in bottom performers. However, we would not expect to find this across mutual fund industries, due to the existing marked differences in development across countries.

3. Data and variables description

This section presents (i) the data employed in our research, (ii) the sources of information, (iii) the data cleaning process and, (iv) other specificities such as fund level and monetary policy variables calculation process. As a quick disclaimer our dataset will comprise worldwide information of equity mutual funds. We believe that most of the work performed so far has been country specific.[6] Nowadays, and given the increasing

[5] Other monetary policy tools, considered to be unconventional in nature, such as, for example, the Asset Purchase Programme, the Targeted Longer-Term Refinancing Operations, among others. For additional detail please refer to: https://www.ecb.europa.eu/mopo/implement/html/index.en.html

[6] Cai, Chan and Yamada (1997) study of Japanese mutual funds; Blake and Timmerman (1998), U.K. funds; Italian funds are studied by Cesari and Panetta (2002); and, European funds are studied by Otten and Bams (2002).

relevance of equity mutual funds in the real economy, we consider that a worldwide evidence might produce more representative conclusions for the relevant community.

3.1. *Data Description*

Our analysis is centered on open-end actively managed equity mutual funds within the 2000-2015 period. Mutual fund data is provided by the Lipper Hindsight database which collects information from fund management companies. Our sample is survivorship bias free, including both active and inactive funds. Following the same data cleaning method performed by Ferreira et al (2012), funds with multiple share classes are excluded to prevent double counting.

To confirm the representativeness of the Lipper Hindsight database, we use the Investment Company Institute (ICI) as a benchmark.

To assure the robustness and significance of our results, we make some restrictions to our database. First, all funds not comprised in the equity mutual fund type are excluded. Second, we require the minimum of 10 funds per month in each country to be accountable for our tests. This is the minimum number of funds required to have accurate results (Ferreira et al, 2012). Third, return is calculated based on monthly data, and the fund size is determined using monthly data. Moreover, at least 36 monthly observations of fund returns are needed to calculate the risk-adjusted return. Fourth, only funds that include the following information, at the fund level, will be analyzed: (i) size, (ii) family size, (iii) age, (iv) total expense ratio, and (v) loads (front-end and back-end loads). In the end, our database includes 18,951 equity funds, while ICI reports 34,060. Thus, our data accounts for about 55,6% of all equity funds detailed in ICI. Regarding TNA, the funds in our database account for $12,5 trillion, while ICI reports a TNA of $14,6 trillion. This represents a coverage of 85,5%. In conclusion, the Lipper Hindsight database accounts for a significant share of data when compared to ICI.[7]

The sample period, between 2000 and 2015, comprehends distinct economic periods and monetary policy considerations. This time window, in turn, comprehends various economic situations such as: (i) a final glimpse of the dot-com bubble, which happened between 1995 and 2001, (ii) a global bull market until the end of 2007, (iii) the international financial crisis in 2008, which had prolonged repercussions in the financial markets, (iv) the sovereign crisis in 2012, which was critical in Europe, and (v) the recovery from the global financial crisis, which had, and still has, differences across countries. In this period of recovery from the financial crisis, some were already able to surpass the crisis and promote a brighter economic outlook, others are still facing the severe damage produced by the crisis, being either through austerity measures from their governments, either via the high costs underlying the financial assistance provided from worldwide supranational infrastructures. Our dataset includes therefore countries at

[7] Nevertheless, see Ferreira et al (2013), Cremers et al. (2016) and Ferreira, Matos and Pires (2018) for a more in-depth description of Lipper's worldwide data coverage.

different economic and financial stages of development, which is, *per se*, a strong argument to promote a region level analysis of our hypothesis.

Table 1 presents detailed data on the number of funds and respective TNA under management, by country.

Table 1 – Number of funds and TNA under management by equity mutual funds

This table presents the total number of funds and TNA by country at the end of 2015, for all funds and splitting our sample into domestic and international funds. See Appendix 1 for variable definitions.

	All Funds		Domestic funds				International funds	
Country	Number	TNA ($mln)	Number	Number (% of Total)	TNA ($mln)	TNA (% of Total)	Number	TNA ($mln)
Argentina	39	476	27	69,2%	466	97,8%	12	11
Australia	1212	181 714	612	50,5%	74 864	41,2%	600	106 851
Austria	246	13 716	13	5,3%	1 244	9,1%	233	12 472
Belgium	353	22 603	14	4,0%	1 339	5,9%	339	21 265
Brazil	895	24 265	895	100,0%	24 265	100,0%		
Canada	1105	310 460	409	37,0%	149 802	48,3%	696	160 659
China	117	26 950	102	87,2%	24 824	92,1%	15	2 127
Denmark	211	35 160	25	11,8%	4 884	13,9%	186	30 276
Finland	175	30 410	33	18,9%	5 209	17,1%	142	25 201
France	1298	230 762	176	13,6%	41 894	18,2%	1122	188 868
Germany	382	169 508	51	13,4%	52 251	30,8%	331	117 257
Greece	56	1 148	25	44,6%	735	64,0%	31	413
Hong Kong	123	64 003	15	12,2%	23 337	36,5%	108	40 666
India	303	46 755	281	92,7%	46 622	99,7%	22	133
Indonesia	55	4 713	55	100,0%	4 713	100,0%		
Ireland	731	376 916	2	0,3%	14	0,0%	729	376 902
Italy	103	23 294	18	17,5%	4 403	18,9%	85	18 892
Japan	1356	316 476	669	49,3%	193 228	61,1%	687	123 248
Liechtenstein	115	7 053					115	7 053
Luxembourg	2304	893 087	2	0,1%	179	0,0%	2302	892 908
Malaysia	252	15 748	142	56,3%	13 346	84,7%	110	2 402
Netherlands	104	28 144	11	10,6%	2 958	10,5%	93	25 187
New Zealand	57	3 225	13	22,8%	699	21,7%	44	2 526
Norway	146	46 770	50	34,2%	10 796	23,1%	96	35 974
Poland	118	7 798	59	50,0%	5 002	64,2%	59	2 795
Portugal	58	1 706	13	22,4%	248	14,5%	45	1 458
Singapore	121	10 749	14	11,6%	1 686	15,7%	107	9 063
South Africa	192	25 572	153	79,7%	19 786	77,4%	39	5 787
South Korea	778	34 895	386	49,6%	26 090	74,8%	392	8 804
Spain	254	27 195	59	23,2%	6 832	25,1%	195	20 362
Sweden	260	138 883	90	34,6%	58 318	42,0%	170	80 565
Switzerland	356	139 822	129	36,2%	61 157	43,7%	227	78 665
Taiwan	309	16 077	155	50,2%	8 977	55,8%	154	7 100
Thailand	234	12 891	165	70,5%	11 749	91,1%	69	1 142
UK	1057	672 753	402	38,0%	326 712	48,6%	655	346 041
US	3476	8 538 703	2364	68,0%	6 221 060	72,9%	1112	2 317 643
Non-U.S.	15475	3 961 699	5265	34,0%	1 208 626	30,5%	10210	2 753 072
All countries	18951	12 500 402	7629	40,3%	7 429 686	59,4%	11322	5 070 715

From Table 1 we can see that the U.S. presents both higher number of funds and TNA, 3 476 funds and $8 538 703 million TNA, respectively. Other countries like Australia (1 212), France (1 298), Japan (1 356) and Luxembourg (2 304) also have a significant number of funds, accounting, together with the U.S., for more than 50% of our universe. On what concerns the TNA, we have a strong concentration in only 5 countries, which are, in addition to the U.S., Luxembourg ($893 087 million), UK ($672 753 million), Ireland ($376 916 million) and Japan ($316 476 million), representing more than 86,4% of the whole TNA examined in our study.

The countries with the fewest number of funds are Argentina (39) and Indonesia (55). Vis-à-vis the number of funds, also the TNA managed by countries like Argentina ($476 million) and Greece ($1 148 million) have the lowest values in our sample.

The disaggregation into domestic and international oriented funds is important to assess the distinct impacts of monetary policy in those funds. Therefore, we expect monetary policy to have distinct impacts on the sensitivity to the flow-performance relationship at the region level. This is because there are some emerging countries that evidence a higher concentration of funds investing solely in their home country, while in more developed countries funds tend to be more prone to also invest transnationally.

3.2. *Variables description*

We start by describing the main fund level variables included in our regression, followed by our monetary policy variables.

3.2.1 Flow measurement

We follow Chevalier and Ellison (1997) and Ferreira et al. (2012) and define flow as the difference in TNA at the end of month for each mutual fund, i.e., the net monthly growth in TNA due to new incoming money, excluding dividends and other capital gains. Fund flow for fund i in country c at month t is calculated as follows:

$$\mathrm{Flow}_{i,c,t} = \frac{\mathrm{TNA}_{i,c,t} - \mathrm{TNA}_{i,c,t-1}\left(1 + \mathrm{R}_{i,c,t}\right)}{\mathrm{TNA}_{i,c,t-1}} \qquad (1)$$

Where $\mathrm{TNA}_{i,c,t}$ is the total net asset value in the local currency of fund i in country c at the end of month t; $\mathrm{R}_{i,c,t}$ is fund i's net raw return from country c in month t. We winsorize fund flows by country at the top and bottom 1% level of the distribution, to minimize the impact of outliers in our results.

3.2.2 Performance measurement

We follow Ferreira et al. (2012) to compute our performance measures. In this sub-section we present a detailed description of the performance indicators we use in our investigation. These measures are (i) raw returns, (ii) benchmark-adjusted returns, and (iii) risk-adjusted returns.

Raw returns are the monthly fund net return (in US dollars) which is gross of taxes and net of total expenses. Moreover, the computation of returns assumes that dividends are immediately reinvested. Benchmark-adjusted returns are calculated by taking the funds' benchmark return to the fund returns as listed by Lipper database. The calculation of this variable is given by:

$$R|BR_{\mathrm{i,c,t}} = R_{\mathrm{i,c,t}} - BR_{\mathrm{i,c,t}} \quad (2)$$

where $R_{i,c,t}$ is the return of fund i in country c at a given date t; and $BR_{i,c,t}$ is the funds' benchmark return i in country c at a given date t. As we will explain next, these variables will be only considered for robustness checks of our main results.

The performance measure we use to shed light in our results is the risk-adjusted return (four factor alpha return), which is the most complete performance indicator. The configuration we use follows the one used in Ferreira et al. (2012) which is based on the work performed by Carhart (1997).

The estimation of the four-factor alpha is an enhancement to CAPM since it includes information regarding the size, the book-to-market factors and it captures the momentum factor first corroborated by Jegadeesh and Titman (1993). The four-factor alphas are given by the following regression:

$$R_{\mathrm{i,t}} = \alpha_I + B_{0i}RM_{\mathrm{t}} + B_{1i}SMB_{\mathrm{t}} + B_{2i}HML_{\mathrm{t}} + B_{3i}MOM_{\mathrm{t}} + \varepsilon_{it} \quad (3)$$

Where all the return measures are denominated in US dollars, R_{it} is the realized return of fund i in excess of the 1 month US Treasury bill in month t; RM_t is the excess return on the market; SMB_t (small minus big) is the average return on the difference between small value portfolio and the average return on the large value portfolio; HML_t (high minus low) is the difference in return between the portfolio with high book-to-market stocks and the portfolio with low book-to-market stocks; and MOM_t (momentum) is the difference in return between the portfolio with the past 12-month winners and the portfolio with the past 12-month losers. At last, e_{it} is the error term[8].

For the calculation of the four-factor alpha a two-step approach is performed. Since the investment geographic focus is relevant to compute this measure, we discriminate the calculation of the four-factor alpha for domestic and international funds. For domestic funds, we regress the previous 36 months of funds' excess return on the local market, size, value and momentum factors. Since we need the estimated beta to predict the return of the fund in the next month, we store it. The monthly alpha is determined next by deducing the realized fund return to the predicted return. As for international mutual funds, we employ the same approach as the one described for the domestic funds except that we calculate the market, size, value and momentum factors for each region. The latter three factors are calculated as value-weighted averages of the corresponding factors for all countries comprising a given region. As in Ferreira et al. (2012), we map the

[8] For a more in-depth description of the procedures used to calculate the risk factors please refer to the Appendix A of Ferreira et al. (2012).

geographic focus into five regions (Europe, Asia–Pacific, North America, Emerging Markets, and Off-shore funds). For funds investing globally we use global factors.

3.2.3 Additional set of fund and country-level variables of control

Table 2, Panel A, presents summary statistics for the fund level variables included in our regressions: (i) size, (ii) family size, (iii) age, (iv) total expense ratio, and (v) loads (front-end and back-end loads). Appendix 1 presents detailed description of these variables. Four-factor alphas are negative in most countries. Funds in more developed countries, including Germany, UK and US, have a larger size and are older, on average. As for the annual fees charged by equity mutual funds, Poland (0.34%) presents higher fees, while Netherlands and Sweden are the countries with the lowest fees (0.11%). As for flows, in our time window, the average monthly flow is 0.19%.

We do not find evidence of high correlation coefficients (see Dohoo et al., 1997 – > 0.7 or < -0.7) between our variables (see Table 2, Panel B in the Appendix 3). We therefore conclude that multicollinearity among variables do not drive the results in our study.

For the country-specific characteristics we use variables presented in Cremers et al. (2015) and include: (i) fund industry size, (ii) fund industry concentration, and (iii) GDP per Capita. We also use data on the regulatory quality and the political stability in each country. The former reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that allow and promote private sector development[9]. The latter, measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism. These scores vary from -2.5 (weak regulatory quality) to +2.5 (strong regulatory quality). We then create dummy variables which assume the value of 1 if the score, for a given country, is above the median and 0 otherwise. In the crisis aftermath, both politics and regulation have been key instruments to boost further markets robustness. Interestingly, and after the crisis, investors have shown more pronounced levels of search for yield. Hence, they are more willing to invest in risky, and unregulated, market segments, as they have more to gain (See Fink et al., 2014). Overall both perform well when considering the whole universe.

Table 3, Panel A, provides summary statistics relatively to country level variables. Luxembourg presents the higher GDP per capita ($102,417) and India the lowest ($1,303). In terms of the size of the industry the US has by far the largest industry ($5.26 trillion). Mutual fund industry concentration is higher in Malaysia (0.36). In the other side, Luxembourg and UK report the most diversified mutual fund industries. As for the regulatory and political indicators, both governance indicators present positive values.

When we test for correlation between these variables, and as evidenced for the fund level variables, we do not find multicollinearity between these variables (see Table 3, Panel B in the Appendix 3).

[9] Data obtained from www.govindicators.org.

Table 2 - Fund characteristics.

This table presents, in Panel A, fund level variables averaged across fund months by country for the period 2000–2015. Panel B, in Appendix 3, presents pairwise correlations among these variables. See Appendix 1 for variable definitions.

Country	Raw Return (%)	Benchmark-adjusted return (%)	Four-factor alpha (%)	Flow (%)	Size ($ million)	Family size ($ million)	Fund age (years)	Fees (%)	SMB	HML
Argentina	1.25	1.05	-0.31	-0.35	11	46	11.56	0.25	0.31	0.06
Australia	0.58	0.57	-0.13	-0.32	181	5,223	9.76	0.14	-0.10	-0.04
Austria	0.50	0.63	-0.24	-0.26	64	1,457	10.24	0.23	0.17	-0.10
Belgium	0.47	0.48	-0.18	-1.18	68	11,274	7.92	0.15	-0.11	-0.10
Brazil	0.07	-0.08	-0.99	-0.70	83	4,421	7.90	0.15	0.21	-0.26
Canada	0.50	0.65	-0.24	-0.09	277	13,024	11.78	0.22	0.04	-0.02
China	0.95	0.99	0.82	-1.8	583	3,14	5.36	0.13	0.35	0.14
Denmark	0.66	0.69	0.01	0.01	136	2,577	11.76	0.14	0.08	-0.12
Finland	0.54	0.56	-0.08	0.46	132	2,910	9.02	0.15	0.18	-0.13
France	0.55	0.57	-0.22	-0.16	176	8,690	11.71	0.18	0.04	-0.05
Germany	0.62	0.70	-0.20	-0.45	339	15,383	13.10	0.18	0.02	-0.12
Greece	-0.07	-0.03	-0.07	-0.04	61	280	11.48	0.28	0.15	0.31
Hong Kong	0.68	0.72	0.13	0.07	392	4,049	11.74	0.17	0.01	-0.16
India	1.34	1.03	0.45	-0.26	113	1,936	7.95	0.18	0.08	-0.66
Indonesia	1.04	1.30	-0.22	0.87	89	369	8.24	0.27	0.37	-0.04
Ireland	0.59	0.66	-0.14	-0.17	400	12,256	8.30	0.18	0.09	-0.06
Italy	0.40	0.70	-0.28	-0.68	227	3,658	10.87	0.21	-0.07	0.06
Japan	0.68	0.64	-0.20	-0.63	161	17,525	9.09	0.15	0.15	0.01
Liechtenstein	0.37	0.59	-0.29	-0.31	68	947	7.79	0.21	0.25	-0.13
Luxembourg	0.57	0.68	-0.20	-0.11	326	14,216	9.55	0.21	0.09	-0.11
Malaysia	0.69	0.61	0.06	-0.66	56	1,879	10.16	0.23	0.21	0.12
Netherlands	0.65	0.66	-0.01	-0.35	319	4,186	13.36	0.11	0.06	-0.09
New Zealand	0.80	0.78	0.00	-0.29	60	543	11.37	0.14	0.12	-0.07
Norway	0.85	0.82	-0.05	0.18	201	3,215	11.40	0.13	0.16	0.002
Poland	0.24	0.49	-0.65	0.99	115	497	7.32	0.34	-0.06	0.31
Portugal	0.25	0.44	-0.27	-0.45	41	313	11.18	0.15	0.11	-0.10
Singapore	0.61	0.83	0.02	-0.57	69	876	10.23	0.24	0.08	-0.18
South Africa	1.06	0.88	-0.21	0.10	145	1,539	10.44	0.16	0.01	-0.24
South Korea	0.56	0.62	-0.37	-2.31	63	3,657	6.29	0.15	0.36	-0.02
Spain	0.47	0.60	-0.30	0.01	65	1,455	10.28	0.17	0.18	0.06
Sweden	0.56	0.64	0.14	0.35	355	13,396	12.74	0.11	0.01	-0.16
Switzerland	0.61	0.74	-0.12	-0.36	314	15,381	11.84	0.13	0.09	-0.10
Taiwan	0.66	0.62	0.09	-0.65	63	1,213	9,91	0.28	0.49	-0.42
Thailand	0.94	0.81	-0.10	-0.32	36	686	9.06	0.14	0.34	-0.18
UK	0.75	0.76	-0.01	-0.07	495	11,036	15.36	0.18	0.21	-0.09
US	0.54	0.59	-0.10	0.22	1,591	74,423	13.31	0.12	0.18	-0.01
All Countries	0.58	0.62	-0.16	-0.19	547	24,539	11.13	0.17	0.11	-0.07

Table 3 - Country characteristics.

This table presents, in Panel A, country level variables averaged across fund months by country for the period 2001–20015. Panel B, in Appendix 3, presents pairwise correlations among these variables. See Appendix 1 for variable definitions.

Country	GDP per capita ($)	Industry Size ($ million)	Industry Herfindahl	Political Stability	Regulatory Quality
Argentina	10,914	658	0.12	0.01	-0.84
Australia	55,171	196,713	0.04	0.95	1.78
Austria	46,126	17,952	0.13	1.21	1.53
Belgium	43,293	37,240	0.30	0.81	1.29
Brazil	11,003	82,038	0.10	-0.14	0.02
Canada	45,082	309,896	0.06	1.06	1.68
China	6,799	79,123	0.08	-0.54	-0.27
Denmark	55,779	31,431	0.11	1.05	1.81
Finland	45,489	26,863	0.17	1.43	1.78
France	39,910	272,034	0.05	0.47	1.20
Germany	41,419	151,747	0.16	0.85	1.57
Greece	18,071	2,132	0.21	-0.01	0.61
Hong Kong	34,703	46,027	0.13	1.04	1.95
India	1,303	34,369	0.10	-1.18	-0.39
Indonesia	3,064	5,895	0.21	-0.76	-0.29
Ireland	53,395	307,54	0.08	1.07	1.70
Italy	34,444	58,907	0.12	0.46	0.93
Japan	39,975	239,323	0.11	1.00	1.12
Liechtenstein	75,971	7,779	0.20	1.32	1.65
Luxembourg	102,417	798,022	0.03	1.40	1.72
Malaysia	9,155	13,970	0.36	0.17	0.60
Netherlands	48,450	43,358	0.15	0.99	1.75
New Zealand	39,025	3,942	0.36	1.38	1.89
Norway	81,345	35,293	0.18	1.28	1.47
Poland	12,565	10,527	0.13	0.88	0.96
Portugal	21,010	2,934	0.18	0.88	0.95
Singapore	42,599	10,588	0.11	1.21	1.89
South Africa	6,576	26,250	0.09	-0.05	0.40
South Korea	23,695	55,399	0.11	0.29	0.96
Spain	29,537	25,298	0.10	-0.11	1.13
Sweden	49,616	104,117	0.18	1.20	1.69
Switzerland	75,66	117,988	0.19	1.32	1.65
Taiwan	19,498	21,568	0.09	0.78	1.11
Thailand	5,086	9,076	0.12	-1.13	0.24
UK	42,673	561,253	0.03	0.39	1.74
US	47,043	5,258,840	0.05	0.45	1.48
All Countries	49,006	2,320,770	0.08	0.71	1.39

3.2.4 Monetary Policy, Business Cycles and Market Fears

We use policy rates at the country level. This information is provided mostly by the Bank of International Settlements (BIS).[10] Because we want to study if monetary policy has an impact in the flow-performance relationship of equity mutual funds, we calculate a moving average of the last twelve months for the variation on the policy rate, available at a country level[11]. Moreover, we only consider the top and bottom quintiles of this variable. The rationale is that by considering more extreme movements on the policy rate we will be able to extract more significant information about its sensitivity to the flow-performance relationship. To conclude, we have two distinct dummy variables, assigning the value of 1 when the monetary policy variable is at the top/bottom quintile previously described and 0 otherwise. One of them for the top 20% up movements and another for the bottom 20% down movements in the policy rate. To the best of our knowledge, we are the first to investigate the impact of monetary policy in the flow performance relationship of equity mutual funds using this configuration.

Table 4 shows policy rates across the countries we examine in this study. From the results, we can see a clear evidence of discrepancy underlying the different levels of policy rates for each country. Interestingly, Japan presents the lowest policy rates (0.11%). Countries belonging to the Euro Area have the same monetary policy setting, since its determination is centralized by the European Central Bank (ECB).

Secondly, and following the same classification performed by Fink et al. (2014), we will use data from OECD to distinguish between different economic periods[12]. We classify as a (i) dummy variable that takes the value of 1 in periods of recession and (ii) dummy variable that takes the value of 1 in expansionary periods. Consequently, we will be able to draw a more comprehensive assessment on how the different economic periods impact on the flow-performance relationship.

Table 5 provides more information about the distinct business cycles comprehending our sample period. In our sample, and from 2000 until 2015, Greece presents the largest number of months in an economic recession, with 142 months out of 251 months analyzed, while Taiwan presents the lowest number of months facing a recession, indicating only 24 months.

Lastly, we use Volatility Index[13], also known as VIX, that represents the market's expectation of 30-day forward-looking volatility[14]. This index is also used in the literature as a measure of market risk, fear and stress. In fact, studies such the one of

[10] Policy rates for Hong Kong, Japan, Indonesia, Taiwan and Thailand are obtained from a distinct set of platforms, available at request.
[11] Nevertheless, we use the same procedure for a rolling average of 3 months, instead of 12. We will use this variable as a robustness test, in section 6.
[12] As is explained by OECD technical specifications, the value of 1 is used as the start of a recession period and the value of -1 as turning point to an expansionary period.
[13] Banegas, et al. (2016) also consider this indicator to examine if economic outlook shapes investors' risk appetite.
[14] Data obtained from the Chicago Board Options Exchange (CBOE).

Huang (2015), suggest that volatility can signal future equity flows. More precisely, we create a variable, lagged by one month, that considers the top quintile of VIX, or, by other words, when the index observes the top 20% level of volatility.

Table 6, in the Appendix 2, presents further details on the VIX index. Besides, this index reflects in its levels the different economic conjunctures comprehending the dates between 2000 and 2015. For the VIX index, the highest the level the more pronounced are market fears given the large levels of volatility in equity markets. As an example, the 10^{th} percentile observes levels of 10.82, while, in turn, the 90^{th} percentile evidences the level of 30.24. Thus, the amplitude in this indicator is pronounced. Moreover, Figure 1 presents the VIX index and its movements, which are strongly related with the various economic periods comprising our time window, such as the global financial crisis of 2007.

We present, in the Appendix 3, the test for correlation for these variables in Table 7. Moreover, we conclude that the variables are not strongly correlated.

A more detailed explanation of the variables mentioned above is presented in the Appendix 1.

Table 4 – Policy Rates.

This table presents the different monetary policy stances, through the policy, across the countries in our sample. Data is from BIS. See Appendix 1 for variable definitions.

Country	Mean (in %)	10% Percentil (in %)	90% Percentil (in %)
Argentina	13.10	9.5	26.73
Australia	3.96	2.25	6.25
Austria	1.67	0.05	4.00
Belgium	1.55	.15	3.75
Brazil	10.71	7.5	13.75
Canada	1.77	0.25	4.25
China	5.74	4.35	6.56
Denmark	1.56	-0.75	4.25
Finland	1.60	0.05	4.00
France	1.61	0.05	4.00
Germany	1.70	0.05	4.00
Greece	1.18	0.05	3.25
Hong Kong	1.61	0.50	5.75
India	7.15	4.75	8.00
Indonesia	7.27	5.75	8.75
Ireland	1.49	0.05	3.75
Italy	2.03	0.05	4.00
Japan	0.11	0.00	0.50
Liechtenstein	0.51	-0.75	2.25
Luxembourg	1.54	0.05	3.75
Malaysia	3.03	2.5	3.50
Netherlands	1.76	0.15	4.00
New Zealand	2.93	2.5	3.50
Norway	2.64	1.5	5.50
Poland	3.55	1.5	5.25
Portugal	1.67	0.15	4.00
Singapore	0.92	0.05	2.90
South Africa	6.60	5.00	10.50
South Korea	2.80	1.75	4.00
Spain	1.82	0.25	4.00
Sweden	1.87	0.25	4.00
Switzerland	0.49	-0.75	2.25
Taiwan	1.96	1.38	2.88
Thailand	2.42	1.25	3.50
UK	2.21	0.50	5.00
US	1.69	0.13	5.25
All Countries	2.13	0.10	5.00

Table 5 – Business Cycles.

This table presents information about the distinct economic business cycles, across countries, from 2000 to 2015. Recession and Expansions periods are built after considering information from OECD. The difference, in months, between recession and expansion periods is expressed in the last column. A positive (negative) value indicates a higher (lower) number of recessions periods.

Country	Recession Periods (nº months)	Expansion Periods (nº months)	Recession Periods - Expansion Periods (nº months)
Australia	131	120	11
Austria	120	131	-11
Belgium	125	126	-1
Brazil	123	128	-5
Canada	105	146	-41
China	107	144	-37
Denmark	128	123	5
Finland	96	155	-59
France	104	147	-43
Germany	127	124	3
Greece	142	109	33
India	99	152	-53
Indonesia	81	170	-89
Ireland	132	119	13
Italy	93	158	-65
Japan	118	133	-15
Luxembourg	128	123	5
Netherlands	133	118	15
New Zealand	98	153	-55
Norway	118	133	-15
Poland	105	146	-41
Portugal	118	133	-15
South Africa	90	161	-71
South Korea	113	138	-25
Spain	110	141	-31
Sweden	99	152	-53
Switzerland	103	148	-45
Taiwan	24	227	-203
UK	76	175	-99
US	96	155	-59
All Countries	3242	4288	-1046

4. Methodology

In this section we present the details of the methodology we perform, which follows to great extent the methodology in Ferreira et al. (2012b). Our aim is to study the impact monetary policy on the flow-performance sensitivity. We use OLS regressions, instead of following a common practice of using VAR models. [15] To the best of our knowledge we are the first to use the methodology presented below to assess the impact of monetary policy on the sensitivity of the flow-performance relationship.

4.1. *The Flow-Performance Relationship*

We run two distinct regressions to analyze the response of flows to past performance:

1- *Linear Regression*

By using a linear regression, we intent to see whether the interaction between monetary policy variables and past performance ranks influence or not flows into and out of mutual funds. We first regress flows on past performance rank, on our set of monetary policy variables and a group of control variables.

$$Flow_{i,c,t} = a + b_{i,c} * PR_{i,c,t-1} + c_{i,c} * PRV_{c,t-1} + d_{i,c} * CV_{i,c,t-1} + \varepsilon_{2,t} \quad (4)$$

where the PR is the performance rank, PRV is the policy rate variable, CV are the control variables, *i* is the mutual fund, *c* is the mutual fund's corresponding country and *t* is the time period. As described before, performance ranks are given by raw returns and risk-adjusted returns and performance ranks are calculated based on the last 12 months returns for each country-month.

We first pool all countries and, because the US is, by far, the country with the largest TNA and number of funds in our sample, we run the regression solely for US and for all countries excluding the US. To ascertain the potential distinct impacts of the monetary policy variables in different regions we also run a regression for different investment regions (Asian Pacific, Emerging Markets, Europe, North America and Off Shores). We include time fixed effects and also country fixed effects when we analyze the results of the regressions considering more than one country.

To analyze the reaction of investors to our policy rate variables, we also add the interaction between the performance measures and run the following regression:

$$Flow_{i,c,t} = a + b_{i,c} * PR_{i,c,t-1} + c_{i,c} * PRV_{c,t-1} + d_{i,c} * PR_{i,c,t-1} * PRV_{c,t-1} + e_{i,c} * CV_{i,c,t-1} + \varepsilon_{2,t} \quad (5)$$

[15] For a detailed explanation on the application of these models please refer to Christiano, Eichenbaum and Evans (1996) and Burachi, Carnelli and Whelan (2014).

While adding the interaction variable we expect to see if, for example, top and bottom quintiles of policy rates variations influence the flow-performance relationship. By that we mean we will be able to infer if investors react to large variations on the policy rate.

2- *Three-piecewise Linear Regression*

Since the existent literature evidences that the flow-performance relationship is convex, as investors react differently to different levels of performance (see, e.g., Chevalier and Ellison, 1997; Sirri and Tufano, 1998; and Ferreira, et al. 2012b), we will split our past performance into low, mid and top quintiles. We then run the following regression:

$$Flow_{i,c,t} = a + b_{i,c} * Low\ PR_{i,c,t-1} + c_{i,c} * Mid\ PR_{i,c,t-1} + d_{i,c} * High\ PR_{i,c,t-1} + e_{i,c} * PRV_{c,t-1} + f_{i,c} * CV_{i,c,t-1} + \varepsilon_{2,t} \quad (6)$$

Where:

$$Low\ PR_{i,c,t-1} = \min(0.2\ , PR_{i,c,t-1})$$

$$Mid\ PR_{i,c,t-1} = \min(0.6\ , PR_{i,c,t-1} - Low\ PR_{\ i,c,t-1})$$

$$High\ PR_{i,c,t-1} = PR - (Low\ PR_{i,c,t-1} + Mid\ PR_{i,c,t-1})$$

where *i* stands for a given mutual fund, *c* represents the country and *t* denotes the month.

We then rerun the regression in equation (6), where we introduce an interaction variable between the different performance quintiles (low, mid and top quintiles) and our monetary policy variable. The main purpose is to study the convexity of the relationship between flow and performance, and its sensitivity to top and bottom variations on the policy rate established by the monetary authorities.

$$\begin{aligned} Flow_{i,c,t} = {} & a + b_{i,c} * Low\ PR_{i,c,t-1} + c_{i,c} * Mid\ PR_{i,c,t-1} + d_{i,c} \\ & * High\ PR_{i,c,t-1} + e_{i,c} * Low\ PR_{i,c,t-1} * PRV_{c,t-1} + f_{i,c} \\ & * Mid\ PR_{i,c,t-1} * PRV_{c,t-1} + g_{i,c} * High\ PR_{i,c,t-1} * PRV_{c,t-1} \\ & + h_{i,c} * Control\ Variables_{i,c,t-1} + \varepsilon_{2,t} \end{aligned} \quad (7)$$

To assess if the coefficients for the bottom and top performance quintiles are statistically different from each other, we run a Wald test, where we test the equality of the bottom and top performance quintiles.

Furthermore, we want to highlight if economic conjuncture influences the impact driven by monetary policy to the sensitivity of flows to past performance. We, therefore, use a dummy variable to explain different economic (or, to a certain extent, monetary policy) periods. Moreover, and given its relevance to get to more detailed conclusions, we will use the information provided by the VIX Index, which offers relevant information about the market's volatility. A detailed description is presented in the following subsections.

4.2. *Modelling Various Economic Periods and Market Fears into our model*

During different business cycles investors and managers may take investment decisions distinctly. One could argue that, for example, during an economic recession, investors are more cautious about their investment decisions. These distinct impacts may provide some useful evidence on the effects of monetary policy to the flow-performance relationship of equity mutual funds in different economic periods. On the other hand, VIX Index broadly represents market fears, hence, its analysis can be important for investors and managers to understand the consequences of having periods of abnormal volatility to the impact that monetary policy might have to the flow-performance relationship of mutual funds.

4.2.1. The Impact of Business Cycles on the Flow-Performance Relationship

To consider different business cycles, we create a dummy variable which introduces a change in the financial and economic landscape on the different countries in our sample.[16] Thus, we use it as an indicator to measure its expected significant sensitivity to the mutual fund flow-performance relationship.

For that we use data from OECD Composite Leading Indicators which provides a set of diverse economic periods of both expansion and recession, where 1 represents the beginning of a recession period and -1 the end of a recession. We then define two dummy variables for recession and expansion periods, with 1 standing for a recession (expansion) and 0 for an expansion (recession) period.

The system is based on a "growth cycle" approach, where Gross Domestic Product (GDP) is used as the reference to signal turning points. Nonetheless, both business cycles and turning points are measured and identified in the so-called deviation-from-trend series. The methodology used to detect those turning points is a simplified version of the original developed by Bry and Boschan (1971), that formulate an automatic algorithm to derive these turning points and business/economic cycles.

In summary, we expect recession periods to have an important influence on the impact of the monetary policy to the mutual fund flow-performance relationship. To assess that we include this variable in our regressions, to understand the impact of the monetary policy to the mutual fund flow-performance relationship during periods of both recession and expansion. The recession periods are country specific.

4.2.2. The Impact of High Levels of Volatility on the Flow-Performance Relationship

As explained in the Section 3, we use the VIX Index to measure market and investors sentiment. This measure is widely considered in the literature since it sheds light to the levels of expected volatility in the market. Thus, the information it conveys could be pertinent for the decision-making process of investors and mutual fund managers. We

[16] Please refer to Fink et al. (2014) which uses the same recession indicators, obtained by, *inter* alia, OECD, for each country to assess if mutual funds outperform during economic downturns.

therefore include this variable in our regressions, using the same rationale as for the recessions periods already explained.

We run the same regressions, for business cycles and VIX Index, as previously detailed in equation 6.

5. Empirical Results

In this section we present and analyze the results of the regressions described in the previous section. The focus of our analysis is on the impact of monetary policy variables on the flow-performance relationship. In section 5.1. we address the impact of extreme variations to the policy rate on the sensitivity of flow-performance relationship. We expect that, by interacting both policy rates and equity mutual fund performance, the response of flows will differ relative to the unique consideration of equity mutual funds' performance. Moreover, we study the impact that gloomier economic periods and higher levels of volatility have on the flow-performance relationship. Which, in turn, we believe to be relevant for a more in-depth comprehension of our results. Finally, we run these regressions for: (i) all countries in our sample; (ii) the different geographic regions defined by the Lipper Hindsight database; (iii) the aggregate of all countries excluding the US; and (iv) just for the US.

5.1. The Impact of Monetary Policy on the Flow-Performance Relationship

To assess the impact of policy rates on the flow-performance relationship, we start by running the regression in equation 4. We then run the regression in equation 5, where we assess the influence of monetary policy on the flow-performance relationship, while considering different performance quintiles. The aim is to analyze if the impact on the flow-performance relationship differs to poor performers and top performers.

Panel A of Table 8 presents the regression results, running the regression in equation 1 and 2 using four-factor alpha as the performance measure.[17]

We find that past performance explains flows into and out of equity mutual funds, consistent with the literature (see, e.g., Wermers, 2003 and Ferreira et al, 2012). The US presents a stronger reaction of flows to past performance. From our results we know that a one decile increase in the performance ranking of the US is expected to be followed by inflows of 2.28% (Column 5), whereas for non-us countries the expected inflows are of 1.69% (Column 3).

Generally, as regards the control variables employed, the results are in line with the literature. For example, larger and older funds tend to get less flows, and these results are statistically significant for all specifications. Our results are consistent with, e.g., Chevalier and Ellison (1997) and Sirri and Tufano (1998). Lagged flows, considered to control for autocorrelation, and family size have a positive and statistically significant

[17] We use raw returns and benchmark-adjusted returns to assess the robustness of our results, in Section 6.

impact on flows in all specifications, consistent with the findings in e.g., Cashman et al. (2007).

When we split our sample into different investment regions, in Table 8 – Panel B, the results are, generally, in line with what we previously depicted from Panel A of Table 8.

5.1.1. The Impact of Monetary Policy on Flows

Regarding the monetary policy variable, the results are in line with what we would expect. When considering the top quintile of the 12-month moving average of policy rate variations the impact on flows is negative and statistically significant. This outcome is expected since when there are positive variations in the policy rate, meaning that money becomes more expensive, the bond market is a more attractive investment to investors. This is because bond yields tend to increase when there are positive variations in the policy rate, making them more valuable, if kept until maturity, to investors (see Banegas, Monte-Rojas and Siga, 2016). Consequently, if on one side the bond markets tend to get more inflows, on the other side the equity mutual funds evidence more outflows. Our results are what we would expect, given that monetary policy setting is prone to influence stock prices and flows into and out of equity mutual funds (See, e.g., Bjornland and Leitemo, 2009). When we focus on the US solely, the top quintile monetary policy variable is not statistically significant. Therefore, and since we have evidenced the positive impact of positive past performance on flows into equity mutual funds, one could infer that an increase on the policy rate has a negative impact on flows, given its negative impact on stock prices.

When we analyze the effects of the bottom quintile of the 12-month moving average of policy rate variations, the results are reversed as expected. This variable accounts for periods of looseness of the policy rate setting, which is typically associated with stronger economic conjuncture and higher levels of investment towards equity markets, since investors tend to increase risk-taking. Similar results can be found in Jesus (2017), where he demonstrates that policy rate cuts lead to more flows into equity mutual funds[18]. Notwithstanding, the coefficients of this variable suggest a lower economic impact than the monetary policy variable top quintile.

As for the region-specific analysis, where the output is displayed in Panel B of Table 8, we find differences across different regions. When we look at emerging markets, there is evidence of outflows in periods of consistent decrease of the policy rate. For North America, the results show counterintuitive results. For example, when we consider the top quintile of the monetary policy variable there is statistically significant positive reaction of flows.

[18] Similar conclusions are drawn by Hau and Lai (2016), whereas the results indicate quantitatively strong equity fund inflows whenever the local monetary policy environment is loose.

5.1.2. The Impact of Monetary Policy on the Flow-Performance Relationship

We find that the response of flows to the interaction of monetary policy and performance is non-linear. In fact, flows suggest distinct reactions when considering the interaction between the top and the bottom quintiles of policy rates and the past performance of equity mutual funds. The results are presented in columns (2), (4) and (6) of Table 8 – Panel A.

When there are positive variations in the policy rate (top quintile) the results suggest a decrease in the importance given to past performance by investors, although they are not statistically significant in the US. Our results are consistent with the empirical findings of Rigobon and Sack (2004). In their study, they evidence that following an increase/decrease of the policy rate there is a decrease/increase in stock prices. This may not be directly related to our investigation, but it shows that monetary policy affects equity markets. Transposing that knowledge to our investigation, we can identify why monetary policy influences the reliance given by investors to past performance to make their investment decisions.

In the case of the bottom quintile of the policy rate the results are in line with what we would expect. Our hypothesis that, for periods registering significant decreases to the policy rate, past performance will be less and less accountable for the flows into and out of equity mutual funds is confirmed. We can argue that a low interest rate environment is related with a continuous increase of flows in equity markets. Besides, these flows also come from the bond markets where the yields are negatively affected. Investors need therefore to direct their money towards other investments. Thus, it is expected to happen a substitution effect between bond markets flows and equity markets flows, through mutual funds and other securities. As for the outcome of this assessment, we can see that considerable reductions on the policy rate have a statistically significant negative impact on the strength of past performance to explain flows into and out mutual funds when in periods of loosen monetary policy. As an example, when we pool all countries in our sample, in column (2), there is a negative impact of -0,30 percentage points on the explanation power of performance, reducing from 1,9% to 1,6% (1,9% - 0,30%), which means, overall, a decrease of about 15,8% on the power of past performance to explain flows. Furthermore, we reject Wald test's null hypothesis that both monetary policy variables exhibit the same values.

Now, we turn our attention to the region-specific analysis displayed in Panel B of Table 8. First, the coefficients are in general in line to what we find in Panel A. Second, only Emerging markets, Europe and North-America have statistically significant results. Third, only for Emerging markets and North America both top and bottom quintiles have statistically significant coefficients, which are also in line with the previous results. As an example, for the Emerging markets, when we consider the effects of past performance on flows, in periods of frequent negative monetary policy variations, the outcome in column (4) suggests that there is an economic and statistically significant decrease. In fact, the

flow-performance sensitivity decreases sharply from 1,32% to 0,13% (1,32% - 1,19%) representing a reduction of 90%.

All things considered, from Table 8, we can reiterate that the results are, in general, in line with our predictions. Furthermore, these results evidence that further attention on this subject is warranted by the investors. Nevertheless, we present a brief summary of our main conclusions. First, monetary policy movements are a relevant determinant of flows and move according to the findings in the literature.[19] A period of consistent downs on the policy rate have a positive impact on flows. Second, for the impact of monetary policy on the flow-performance relationship our results suggest that when economy is loose (monetary policy variable bottom quintile) investors increase their levels of risk-taking and direct their investments towards the equity markets (Jesus, 2017), while giving less reliance to past performance. Also, when we consider the monetary policy variable top quintile the importance of past performance seems to be reduced. However, if we consider raw returns (see Table 9) as our performance indicator, the results reverse. This could also make sense, since when we are in economic periods of high policy rates, investors tend do direct their investments towards the bond market given its high yields. In turn, that is the main reason for them to be more careful and risk averse when it comes to invest in the equity market. In this situation, the opportunity cost of investing in equity markets rather than in bond markets increases making investors more reliant on past performance in order to determine their investment decisions.

Nevertheless, we find some results that are different from what we would expect. In Europe, the monetary policy easing seems to not have an impact on the flow-performance relationship. This result may be explained by the pursuance of other forms of monetary policy, such as Quantitative Easing programs (see, e.g., Guo, 2015). Those were implemented given the lack of maneuver to make further stimulus through the policy rate, which was already in the zero-lower bound[20]. Consequently, there are numerous periods in our sample, for European countries that are part of Euro Zone, where the movements of the policy rate are zero, which might have caused the insignificance of the impact of monetary policy bottom quintile to the flow-performance relationship.[21]

[19] See, among others, Rajan (2005), Bjornland and Leitemo (2009) and Jesus (2017).
[20] See Christensen (2019) to better understand the zero-lower bound definition, and its implications, of interest rates.
[21] Although we see merits in analysing further the impacts of unconventional monetary policy tools to the flow-performance relationship we do not analyse them in this study (see Boel and Waller, 2015)

Table 8 – 4 Factor Alpha Return **- Impact on flow-performance relationship**
Panel A: **All Countries and Country Specific**

	All Countries		Non-US		US	
	(1)	(2)	(3)	(4)	(5)	(6)
Performance	0.01760***	0.01877***	0.01687***	0.01810***	0.02275***	0.02437***
	(38.99)	(32.42)	(34.40)	(28.76)	(23.12)	(19.75)
Performance * M.P.R - 12month - top quintile		-0.00242*		-0.00311**		-0.00230
		(-1.95)		(-2.35)		(-1.04)
Performance * M.P.R - 12month - bottom quintile		-0.00295***		-0.00268**		-0.0053***
		(-2.78)		(-2.35)		(-2.90)
M.P.R - 12month - top quintile	-0.00610***	-0.00494***	-0.00737***	-0.0059***	0.00204	0.00317*
	(-7.30)	(-5.47)	(-8.27)	(-6.06)	(1.41)	(1.77)
M.P.R - 12month - bottom quintile	0.00170***	0.00316***	0.00222***	0.00356***	0.00169	0.00426***
	(2.88)	(4.32)	(3.85)	(4.74)	(1.63)	(3.32)
Log Size	-0.00070***	-0.00071***	-0.00068***	-0.0007***	-0.0005***	-0.0006***
	(-9.85)	(-9.89)	(-8.80)	(-8.84)	(-2.75)	(-2.78)
Log Family Size	0.00060***	0.00060***	0.00063***	0.00062***	0.00043***	0.00042***
	(9.65)	(9.64)	(9.15)	(9.13)	(2.59)	(2.58)
Log Age	-0.00415***	-0.00415***	-0.00365***	-0.0037***	-0.0084***	-0.0084***
	(-22.94)	(-22.96)	(-19.17)	(-19.19)	(-14.14)	(-14.13)
Fees	-0.10418	-0.10197	-0.13148	-0.12932	0.13681	0.15894
	(-0.57)	(-0.56)	(-0.69)	(-0.68)	(0.17)	(0.19)
Flow	0.14270***	0.14267***	0.13492***	0.13489***	0.24465***	0.24455***
	(39.04)	(39.03)	(35.86)	(35.85)	(15.02)	(15.02)
Country fixed effects	Yes	Yes	Yes	Yes	No	No
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.039	0.039	0.035	0.035	0.107	0.107
Number of observations	1329678	1329678	1208844	1208844	120834	120834

This table presents the results of the regressions in equation 4 and 5, which investigates the influence that the top and bottom quintiles of the 12-month moving average of the country specific policy rate variations have on the flow-performance relationship. Columns (1) and (2) present the results for all countries, columns (3) and (4) for non-US countries and Columns (5) and (6) for the US. Weighted least squares is used where each observation is weighted by the inverse of the number of funds in each month-country. See Appendix 1 for variable definitions. Robust t-statistics clustered by the month and country are reported in parentheses. p-values in parentheses; *, ** and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 8 – **4 Factor Alpha Return** - Impact on flow-performance relationship
Panel B: Region Specific

	Asian Pacific		Emerging		Europe		North America		Off-Shore	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Performance	0.0082***	0.0091***	0.0090***	0.0132***	0.0157***	0.0166***	0.0237***	0.0249***	0.025***	0.026***
	(8.37)	(8.21)	(5.50)	(6.31)	(30.26)	(24.17)	(27.98)	(22.82)	(19.29)	(15.05)
Performance * M.P.R - 12month - top quintile		-0.00261		-0.00780*		-0.003***		0.00330		-0.0011
		(-1.11)		(-1.68)		(-2.59)		(1.12)		(-0.31)
Performance * M.P.R - 12month - bottom quintile		-0.00183		-0.012***		-0.00105		-0.007***		-0.0025
		(-0.75)		(-2.99)		(-0.90)		(-3.21)		(-0.81)
M.P.R - 12month - top quintile	-0.00252**	-0.00124	-0.00251	0.00085	-0.0068***	-0.0052***	0.0080***	0.00606**	-0.01***	-0.01***
	(-2.37)	(-0.75)	(-1.21)	(0.35)	(-6.09)	(-4.19)	(2.87)	(2.05)	(-4.63)	(-4.42)
M.P.R - 12month - bottom quintile	0.00084	0.00180	-0.00114	0.00493*	0.00271***	0.00322***	0.00010	0.00314	0.0026*	0.0038**
	(0.70)	(1.22)	(-0.53)	(1.94)	(3.93)	(3.72)	(0.04)	(1.10)	(1.90)	(2.14)
Log Size	-0.00039**	-0.00039**	-0.0013***	-0.0013***	-0.0006***	-0.0006***	-0.0007***	-0.0007***	-0.001***	-0.001***
	(-2.27)	(-2.26)	(-3.59)	(-3.60)	(-5.45)	(-5.48)	(-4.68)	(-4.78)	(-5.98)	(-5.98)
Log Family Size	0.00048***	0.00047***	0.00080***	0.00080***	0.00029***	0.00029***	0.00052***	0.00051***	0.0013***	0.0013***
	(3.38)	(3.36)	(3.14)	(3.17)	(3.63)	(3.62)	(4.71)	(4.68)	(7.68)	(7.68)
Log Age	-0.0049***	-0.0049***	-0.00145	-0.00162	-0.0028***	-0.0028***	-0.0081***	-0.0080***	-0.004***	-0.004***
	(-6.30)	(-6.30)	(-1.21)	(-1.35)	(-12.59)	(-12.62)	(-21.19)	(-21.09)	(-9.24)	(-9.25)
Fees	-0.41192	-0.42359	-0.16126	-0.15403	-0.7593***	-0.7596***	1.57271**	1.57639**	0.2230	0.2329
	(-1.05)	(-1.08)	(-0.24)	(-0.23)	(-3.30)	(-3.30)	(2.50)	(2.51)	(0.61)	(0.64)
Flow	0.23702***	0.23699***	0.22129***	0.22090***	0.11433***	0.11431***	0.14144***	0.14114***	0.1383***	0.1383***
	(13.40)	(13.40)	(16.10)	(16.09)	(24.38)	(24.38)	(10.92)	(10.90)	(21.82)	(21.82)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.078	0.078	0.081	0.081	0.029	0.029	0.053	0.054	0.039	0.039
Number of observations	142148	142148	59226	59226	622662	622662	210440	210440	295202	295202

5.1.3. The Impact of Monetary Policy on Flow-Performance Relationship Convexity

The study of the determinants impacting the sensitivity of the flow-performance relationship has been widely addressed in the literature. Currently, the literature is vast about the impact of a set of characteristics, endogenous to the mutual fund industry, on the sensitivity of the flow-performance relationship.[22] Nevertheless, the literature is scarce about the role of monetary policy as an expected influencer to the sensitivity of the relationship between flows and past performance. Thus, we apply the regressions in equation 7 to further analyze the different impacts of monetary policy on the bottom and top quintiles of past performance.

Table 10 presents the output of the regressions described in equation 7. The results analyzed suggest different reactions of past performance bottom and top quintiles to the flows into and out of mutual funds. When we study the influence of positive variations to the policy rate (top quintile) on the flow-performance relationship, in column (1), the results are statistically insignificant for all countries. Nevertheless, when we consider all countries except the US, in column (7), the results suggest that investors tend to buy fewer top performers when policy rates increase. As for the regions in our analysis the results suggest that, for Off-Shore markets, investors are keen to sell more poor performers when policy rate increases. Moreover, only Europe shows statistically significant results suggesting that investors are less sensitive to top performers when there are constant increases on the policy rate.

When we consider the monetary policy variable bottom quintile to further explain the effects on the sensitivity of the flow-performance relationship the results present greater significance when compared to the monetary policy variable top quintile. In fact, when we analyze the results for all countries, we find a decreasing reaction of investors to poor performance, which is statistically significant, when policy rate decreases. Concretely, investors are keen to sell fewer poor performers, which can be explained by the overall positive effects that a loose monetary policy has in equity markets. For top performers the results are not significant. Moreover, the results for the US evidence more economic significance than for all countries and follow the same reasoning, of investors being more likely to sell fewer poor performers when the economy is loose. As for the different regions, only North-America presents statistically significant results, and these are aligned with the explanation previously highlighted for all countries and the US. However, for the top performers in the region of Asian Pacific the results suggest that investors chase winners more when there are substantial decreases on the policy rate.

In conclusion, for all countries, excluding the US, periods of monetary policy tightening seem to have a determinant impact on the sensitivity of flow-performance relationship. Moreover, this is in line with what we would expect, since for the decision to increase the policy rate, which is usually related to an unwarranted increase in inflation, is made with

[22] Please refer to Chevalier and Ellison (1997), Sirri and Tufano (1998), Berk and Green (2004), Huang, Wei and Yan (2007), and Ferreira et al. (2012).

the purpose to bring inflation down to values aligned with the operational target of central banks. While for monetary policy loosening, and considering our time window, acts more as an instrument to fight financial and economic recessions, which is expected to not have the same level of impact, as monetary policy tightening, on the flow-performance relationship.[23] This is because the policy rate setting is not the solely instrument used to stimulate the real economy. There are other forms of unconventional monetary policy that are well known for being more effective to the real economy than policy rate setting. This, in turn, helps to explain the lack of significance observed for the results considering monetary policy loosening. Nevertheless, monetary policy is known to be a key instrument to fight economic and financial crisis. In periods of deep recession central banks and monetary authorities tend to cut the policy rate in order to help to stimulate the real economy.

[23] One should see that periods of looseness have an impact on the US and that, consequently, highly influences the results when we analyze all countries.

Table 10 - 4 Factor Alpha Return **- Impact on the sensitivity of the flow-performance relationship**
All Countries, Region and Country Specific

	All Countries	Asian Pacific	Emerging	Europe	North America	Off-Shore	Non-US	US
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Low Perf.	0.02581***	-0.00257	0.00243	0.0372***	0.0394***	0.0191***	0.0235***	0.035***
	(11.09)	(-0.45)	(0.25)	(11.14)	(8.19)	(3.20)	(9.51)	(5.85)
Low Perf. * M.P.R - 12month - top quintile	0.00380	-0.00577	0.02425	-0.00414	0.00507	0.02396*	0.00613	-0.00141
	(0.79)	(-0.52)	(1.46)	(-0.61)	(0.55)	(1.87)	(1.20)	(-0.11)
Low Perf. * M.P.R - 12month - bot quintile	-0.00864*	0.00527	-0.02172	-0.00781	-0.01800*	-0.00479	-0.00451	-0.037***
	(-1.89)	(0.44)	(-1.10)	(-1.23)	(-1.91)	(-0.41)	(-0.94)	(-3.53)
Mid Perf.	0.01360***	0.0098***	0.0086***	0.0093***	0.0177***	0.0225***	0.0134***	0.018***
	(19.51)	(6.95)	(2.69)	(10.81)	(12.61)	(12.92)	(17.86)	(11.03)
Mid Perf. * M.P.R - 12month - top quintile	-0.00218	-0.00494	-0.00800	-0.00008	0.00116	-0.00319	-0.00281*	-0.00368
	(-1.53)	(-1.60)	(-1.27)	(-0.05)	(0.38)	(-0.90)	(-1.84)	(-1.04)
Mid Perf. * M.P.R - 12month - bot quintile	-0.00268**	-0.00758**	-0.01060	-0.00079	-0.00460*	-0.00245	-0.00320**	-0.00182
	(-2.01)	(-2.53)	(-1.60)	(-0.48)	(-1.79)	(-0.78)	(-2.24)	(-0.64)
Top Perf.	0.05018***	0.01588**	0.0561***	0.0514***	0.0598***	0.0608***	0.0481***	0.052***
	(16.24)	(2.15)	(4.12)	(12.00)	(9.27)	(7.21)	(14.69)	(6.47)
Top Perf. * M.P.R - 12month - top quintile	-0.01029	0.01633	-0.04324	-0.0274***	0.01635	-0.01036	-0.01500**	0.00560
	(-1.58)	(1.31)	(-1.44)	(-3.49)	(0.89)	(-0.54)	(-2.21)	(0.37)
Top Perf. * M.P.R - 12month - bot quintile	0.00005	0.02684**	-0.01188	0.00332	-0.01045	-0.00001	0.00262	-0.00558
	(0.01)	(2.34)	(-0.40)	(0.41)	(-0.82)	(-0.00)	(0.45)	(-0.44)
M.P.R - 12month - top q.	-0.00595***	-0.00042	-0.00357	-0.0055***	0.00613*	-0.0170***	-0.0074***	0.00319
	(-5.13)	(-0.18)	(-1.12)	(-3.38)	(1.96)	(-4.53)	(-5.97)	(1.41)
M.P.R - 12month - bot q.	0.00405***	0.00163	0.00646*	0.0043***	0.00465	0.00418*	0.0035***	0.0088***
	(4.30)	(0.68)	(1.86)	(3.47)	(1.48)	(1.69)	(4.04)	(4.74)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.039	0.078	0.082	0.029	0.054	0.039	0.035	0.107
Number of observations	1329678	142148	59226	622662	210440	295202	1208844	120834

This table presents the results of the regression, described in equation 7, on the influence that the top and bottom quintiles of the 12-month moving average of the country specific policy rate variations have on the sensitivity of the flow-performance relationship. The performance distribution is duly divided onto quintiles, which are detailed in equation 6. Weighted least squares is used where each observation is weighted by the inverse of the number of funds in each month-country. Some variables are excluded in those table but available at request. See Appendix 1 for variable definitions. Robust t-statistics clustered by the month and country are reported in parentheses. p-values in parentheses; *, ** and *** indicate significance at the 10%, 5%, and 1% level, respectively.

To give further insights about our results we provide an empirical analysis looking at the distinct impacts of monetary policy to the flow-performance relationship when considering: (1) different economic periods; and (2) different levels of market fears (See Table 11). The former distinguishes between recession and expansion periods, following the same construction process as in Fink et al. (2014). The latter represents the VIX index, whereas we consider the top quintile of the distrubition as a signal of extreme market fears. Our analysis aim to shed light on the role of monetary policy, to the flow-performance relationship of equity mutual funds, in distinct business cycles and markets sentiment.

In what concerns the consideration of distinct economic business cycles in our specifications, we further analyze its main findings. For the bottom performance, the impact of monetary policy depends on whether the economy is facing a recession or an expansion period. Therefore, when we analyze the role of monetary policy during economic downturns it is possible to infer that the loosening of monetary policy makes investors less sensitive to poor performance. For top performers, however, the results are not significant. For expansion periods, while considering moments of monetary policy tightening (policy rate top quintile), the results suggest that investors tend to sell more poor performers.

We then look at the relevance of market fears, or by other words market's volatility, represented as the top quintile of the VIX index. Our results show that, during periods of moderate and low market fears, only the interaction between monetary policy top quintile and poor performance is statistically significant. Hence, it suggests than an increase on the policy rate is associated with investors decision of selling more poor performers. In the other hand, in periods of extreme market fear poor performers, there is a clear sign that monetary policy stance of either loosening or tightening encourage investors to react less to poor performance. Moreover, a decrease on the policy rate is associated with investors decision of buying more top performers when the markets face high volatility.

In conclusion, we can argue that monetary policy role on the flow-performance relationship of equity mutual funds is dependent in terms of the distinct economic periods and market feelings it faces.

Table 11 – 4-Factor Return **- Impact on the sensitivity of the flow-performance relationship (considering distinct business cycles and market sentiments - VIX)**
All Countries

	Recession Period	Expansion Period	Extreme market fear (Vix)	Moderate and low market fear (Vix)
	(1)	(2)	(3)	(4)
Low Perf.	0.02791***	0.02725***	0.03395***	0.02435***
	(7.35)	(8.54)	(5.27)	(9.69)
Low Perf. * Policy Rate - 12month - top quintile	-0.00639	0.01261**	-0.02826**	0.01169**
	(-0.72)	(2.10)	(-2.48)	(2.18)
Low Perf. * Policy Rate - 12month - bot quintile	-0.01577**	-0.00765	-0.03094***	-0.00751
	(-2.36)	(-1.13)	(-3.14)	(-1.40)
Mid Perf.	0.00915***	0.01671***	0.00907***	0.01391***
	(9.39)	(17.57)	(4.15)	(19.63)
Mid Perf. * Policy Rate - 12month - top quintile	-0.00042	-0.00393**	0.00233	-0.00236
	(-0.16)	(-2.28)	(0.61)	(-1.60)
Mid Perf. * Policy Rate - 12month - bot quintile	-0.00060	-0.00408**	0.00029	-0.00186
	(-0.37)	(-2.05)	(0.10)	(-1.24)
Top Perf.	0.04343***	0.05763***	0.01008	0.05072***
	(8.45)	(13.85)	(1.09)	(15.24)
Top Perf. * Policy Rate - 12month - top quintile	-0.01441	-0.00944	0.00460	0.00217
	(-1.23)	(-1.13)	(0.32)	(0.29)
Top Perf. * Policy Rate - 12month - bot quintile	-0.00109	0.00652	0.03484***	0.00308
	(-0.13)	(0.82)	(2.77)	(0.48)
Policy Rate - 12month - top quintile	-0.00374*	-0.00819***	-0.00128	-0.00675***
	(-1.80)	(-5.42)	(-0.52)	(-5.35)
Policy Rate - 12month - bot quintile	0.00449***	0.00444***	0.00972***	0.00326***
	(3.44)	(3.09)	(3.90)	(3.03)
Log Size	-0.00097***	-0.00105***	-0.00143***	-0.00087***
	(-8.82)	(-10.93)	(-7.15)	(-11.55)
Log Family Size	0.00082***	0.00087***	0.00040***	0.00089***
	(8.69)	(10.82)	(2.74)	(13.61)
Log Age	-0.00418***	-0.00528***	-0.00170***	-0.00513***
	(-13.93)	(-22.44)	(-4.08)	(-26.36)
Fees	-1.69042***	-0.36665	-1.96830***	-0.72696***
	(-6.35)	(-1.52)	(-4.17)	(-3.85)
Flow	0.11269***	0.13002***	0.06389***	0.13702***
	(22.90)	(27.94)	(8.73)	(37.50)
Country fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Adjusted R-squared	0.028	0.038	0.021	0.039
Number of observations	616456	791473	224991	1239101

This table presents the results on the influence that the top and bottom quintiles of the 12-month moving average of the country specific policy rate variations have on the sensitivity of the flow-performance relationship when facing distinct business cycles (column (1) and (2)) and market sentiments (column (1) and (2)). The performance distribution is duly divided onto quintiles as described in equation 6. The control variables included are described in section 4. Robust t-statistics clustered by the month and country are reported in parentheses. p-values in parentheses; *, ** and *** indicate significance at the 10%, 5%, and 1% level, respectively.

6. Robustness

We have presented the results of monetary policy on the sensitivity of flow-performance relationship in Section 5 using the same measurement of performance as Carhart (1997), the four-factor alpha. Hence, it is important to address the qualitative sustainability of our results through, not only different measures of performance, but also including country-level variables in our regressions.

For the first case, when we use either raw either benchmark returns, the results sustain qualitatively. Nevertheless, it suggests that, by using these measures of performance, the explanation power of monetary policy augments in what concerns its impact on the sensitivity of the flow-performance relationship. We provide those results in Tables 9, 12, 13 and 14 of Appendix 4.

Moreover, to see if our results persist, we control our regressions using country specific indicators. In that sense, we will be able to discern if the impact to the flow-performance relationship of equity mutual funds stems from monetary policy or if it is driven by other country level indicators. From our analysis, the results do not qualitatively differ. Hence, we can infer that the impact of monetary policy on the flow-performance relationship of equity mutual funds sustains, even after considering country-specific indicators which could, presumably, bring statistical noise to our main findings. We also include those results in the Appendix 4, more precisely, in Table 15.

Furthermore, we test the inclusion of a different monetary policy variable configuration, to see if our results remain alike. For that, and instead of using our primary twelve-month moving average of the variations of the policy rate, we changed the configuration to a three-month moving average. We use this configuration to assess if shorter periods of policy rates variation have the same impact on the flow-performance relationship of equity funds as our initial policy rate variable. Interestingly, there is evidence of less intuitive, more contradictory, and less statistically significant outcomes. This could be explained by the major role monetary policy plays, not only in really short time windows, but also in the long term. Hence, the usage of the twelve-month average variation on the policy rate seems justified. In fact, our comprehensive analysis is corroborated, not only by Bjornland and Leitemo (2009), which argue that stock prices tend to respond with significant delay to monetary policy changes, but also by Rigobon and Sack (2004) evidence, using high-frequency data, that following an increase in the policy rates is a decline in stock prices. The results of this regression are presented in Table 16 of Appendix 4.

7. Conclusion

In summary, and as argued by Hau and Lai (2016), our investigation provides evidence that extreme variations on monetary policy setting have an impact on the sensitivity of the flow-performance relationship of equity mutual funds. While using these extreme variations in the form of top and bottom quintiles, we can conclude that its reactions to

the flow-performance are divergent, which is in line with the related literature. Moreover, we provide evidence that confirms our hypothesis that monetary policy has non-linear impacts on the top and bottom ends of the performance distribution. Nevertheless, to the best of our knowledge, we are the first to assess, the impact of monetary policy on the flow-performance relationship of equity mutual funds. Therefore, our results are important for several reasons.

First, and in the perspective of monetary policy decision making bodies, having empirical evidence that the setting of monetary policy is transmitted to the real economy is a vital support to make effective policy decisions. Concretely, our study demonstrates that great monetary policy movements have a non-negligible impact to the decision making of investors and mutual fund managers. On one side, we have that monetary policy setting have an impact in the flows into and out of equity mutual funds. On the other side, it also suggests having an impact on the flow-performance relationship.

Second, and considering the pursuance of central banks to make decisions that effectively guarantee the transmission of monetary policy to the real economy, our study shows that monetary policy has an impact on investment. Therefore, households are prone to make investment decisions when there are significant movements to the policy rates. Lastly, one cannot forget the current economic conjuncture. Most Central Banks have their policy rates in negative territory, the so-called negative interest rate policy (NIRP), as an aftermath legacy from the deep global financial crisis of 2007. The continuous cuts, sometimes to negative territory, to the policy rate showed to be ineffective to stop the malicious effects of the crisis. In that sense, quantitative easing, an unconventional set of measures, was established to complement conventional monetary policy setting. For example, the implementation of the Asset Purchase Programme (APP) by the European Central Bank (ECB), which is solely a bond buying program. These days, when further stimulus measures are being studied, equity purchase programs may find their place on the decision-making bodies agendas, especially given the already heavy presence of the ECB in the bond markets. Monetary policy authorities could take our findings into account, in the event of deciding whether to implement an equity purchase program, as our results evidence an impact of monetary policy setting on the flow-performance relationship of equity mutual funds. Just as we have evidenced that monetary policy influences stock markets, as argued by Bjornland and Leitemo (2009), stock market is also an important set of information for the conduct of monetary policy.

Lastly, having accurate estimates of the influence that monetary policy has on the equity markets is a valuable information for investors, to help them formulate their investment decisions. Besides, our results provide investors with another relevant finding, that longer periods of continuous movements to the policy rate have a deeper impact on the flow-performance relationship of equity funds.

Nevertheless, we believe that a more thorough assessment using variables proxied to quantitative easing and the forward-looking communication conducted by monetary authorities would bring further robustness to our findings.

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Appendix

Appendix 1. Variable definitions

Variable	Definition
Panel A: Fund characteristics	
Raw return	Fund net return in local currency (percentage per month) (Lipper).
Benchmark–adjusted return	Difference between the fund net return and its benchmark return (percentage per month).
Four–factor alpha	Four–factor alpha (percentage per month) estimated with three years of past monthly fund excess returns in local currency. We use local factors (fund domicile) for domestic funds, regional factors for regional funds, and world factors for global funds. Regional factors include Asia–Pacific, Europe, North America, Emerging, Global, and Global Ex–US) , and the classification is based on the fund′s investment region using data on fund's domicile country and fund's geographic investment style provided by the Lipper database.
Flow	Percentage growth in TNA (in local currency) in a month, net of internal growth (assuming reinvestment of dividends and distributions) into funds with the same investment style, i.e., geographical focus.
Size	Total net assets in millions of US dollars (Lipper).
Family size	Family total net assets in millions of US dollars of other equity funds in the same management company excluding the own fund TNA (Lipper).
Age	Number of years since the fund launch date (Lipper).
Expense ratio	Total expense ratio (Lipper).
SMB	Loadings on the small–minus–big size factor (SMB) from four–factor alpha regressions.
HML	Loadings on the high–minus–low factor (HML) from four–factor alpha regressions.

Panel B: Country characteristics

GDP per country	Gross Domestic Product per capita (World Development Indicators).
Fund industry equity size/Mcap	The size of the mutual fund equity industry (from ICI) as a percentage of the stock market capitalization (from World Development Indicators)
Fund industry Herfindahl index	Sum of squared market shares of fund management companies for mutual funds in the fund's country (computed using Lipper data)
Regulatory Quality	Regulatory quality measures the perceptions about the ability of the government ((in each country, per month) to formulate and implement sound policies and regulations that permit and promote private sector development (Source: Worldwide Governance Indicators).
Political Stability	Political stability measures perceptions of the likelihood of political instability and/or politically-motivated violence (in each country, per month), including terrorism (Source: Worldwide Governance Indicators).

Panel C: Monetary Policy characteristics

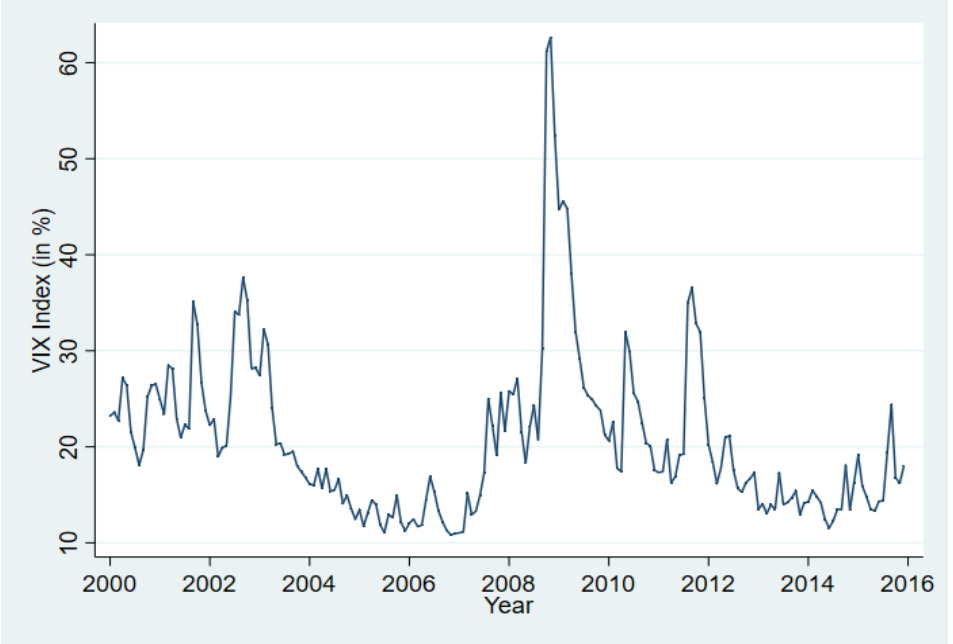
Policy Rate	Central bank policy rates (percentage per month) in each country (Source: BIS policy rate statistics).
Economic Business Cycles	Expansion and recession periods (per month) in each country using a simplified version of the original Bry and Boschan routine. (Source: OECD Composite Leading Indicators – turning points)
VIX Index	VIX Index level (in percentage per month) is calculated using mid-quote prices of the S&P 500 call and put options and is one of the most recognized measures of volatility. (Source: Chicago Board Options Exchange)

Appendix 2. VIX Index

Table 6 - VIX Index. **This table presents the VIX Index that, in turn, represents the market's expectation of 30-day forward-looking volatility.**

	Mean	Min	10% percentile	90% percentile	Max
VIX Index Levels (%)	19.68	10.82	12.47	30.24	62.64

Figure 1 - VIX Index. **This figure displays the VIX Index behaviour through the whole time series in analysis, from 2000-2015.**



Appendix 3. Correlation Tests

Table 2 - Fund-level variables. Panel B presents the pairwise correlation of fund-level variables. * indicate significance at the 10% level

	1	2	3	4	5	6	7	8	9	10
Raw Return	1.0000									
Benchmark Return	0.2718*	1.0000								
Four-factor alpha	0.4210*	0.3941*	1.0000							
Flows	0.0222*	0.0053*	0.0188*	1.0000						
Size	0.0029*	0.0052*	0.0034*	0.0092*	1.0000					
Family size	0.0061*	0.0091*	0.0061*	0.3504*	0.0179*	1.0000				
Fund age	0.0013	0.0060*	0.0004	0.1750*	0.1098*	-0.0242*	1.0000			
Fees	-0.0066*	-0.0167*	-0.0247*	-0.1101*	-0.1952*	-0.0253*	-0.0056*	1.0000		
SMB	0.0107*	0.0036*	-0.0038*	-0.0297*	-0.0102*	-0.0084*	-0.0311*	0.0911*	1.0000	
HML	-0.0003*	0.0164*	0.0107*	0.0055*	0.0167*	0.0114*	0.0247*	-0.0716*	-0.1909*	1.0000

Table 3 - Country-level variables. Panel B presents the pairwise correlation of country-level variables. * indicate significance at the 10% level

	1	2	3	4	5
GDP per capita	1.0000				
Industry Size	0.0844*	1.0000			
Industry Herfindahl	-0.2293*	-0.2802*	1.0000		
Political Stability	0.6872*	-0.1507*	0.0105*	1.0000	
Regulatory Quality	0.6026*	0.0820*	-0.2491*	0.6570*	1.0000

Table 7 - Monetary Policy and VIX variables. **Presents the pairwise correlation of monetary policy and VIX variables.** * indicate significance at the 10% level

	1	2	3	4	5
M.P.R - bottom quintile - 3months	1.0000				
M.P.R - top quintile - 3months	-0.4121*	1.0000			
M.P.R - bottom quintile - 12months	0.2483*	-0.2309*	1.0000		
M.P.R - top quintile - 12months	-0.3331*	-0.6003*	-0.2657*	1.0000	
Vix - top quintile - extreme volatility	0.1773*	-0.0708*	0.2236*	-0.0101*	1.0000

Appendix 4. Robustness Tests

Table 9 – Raw Return **- Impact on flow-performance relationship**
Panel A: **All Countries and Country Specific**

	All Countries		Non-US		US	
	(1)	(2)	(3)	(4)	(5)	(6)
Performance	0.02026***	0.02099***	0.01951***	0.02057***	0.02722***	0.02844***
	(39.49)	(32.75)	(35.63)	(29.91)	(24.92)	(21.25)
Performance * Policy Rate - 12month - top quintile		0.00140		-0.00017		0.00500**
		(0.89)		(-0.10)		(2.01)
Performance * Policy Rate - 12month - bottom quintile		-0.00369***		-0.00391***		-0.00661***
		(-3.07)		(-3.10)		(-3.55)
Policy Rate - 12month - top quintile	-0.00600***	-0.00671***	-0.00730***	-0.00722***	0.00345**	0.00060
	(-7.24)	(-6.62)	(-8.25)	(-6.80)	(2.37)	(0.30)
Policy Rate - 12month - bottom quintile	0.00170***	0.00353***	0.00231***	0.00425***	0.00248**	0.00613***
	(2.88)	(4.61)	(3.99)	(5.57)	(2.38)	(4.08)
Log Size	-0.00088***	-0.00089***	-0.00086***	-0.00086***	-0.00065***	-0.00066***
	(-12.16)	(-12.23)	(-10.90)	(-10.96)	(-3.29)	(-3.33)
Log Family Size	0.00058***	0.00058***	0.00061***	0.00061***	0.00042**	0.00042**
	(9.45)	(9.44)	(8.96)	(8.94)	(2.56)	(2.51)
Log Age	-0.00426***	-0.00427***	-0.00374***	-0.00374***	-0.00846***	-0.00845***
	(-23.53)	(-23.53)	(-19.65)	(-19.66)	(-14.28)	(-14.25)
Fees	-0.21578	-0.21964	-0.17983	-0.17875	-0.01054	0.00909
	(-1.18)	(-1.20)	(-0.94)	(-0.93)	(-0.01)	(0.01)
Flow	0.14060***	0.14054***	0.13306***	0.13301***	0.24045***	0.24017***
	(38.58)	(38.57)	(35.45)	(35.44)	(14.76)	(14.74)
Country fixed effects	Yes	Yes	Yes	Yes	No	No
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.040	0.041	0.037	0.037	0.109	0.109
Number of observations	1329678	1329678	1208844	1208844	120834	120834

Table 9 – **Raw Return -** Impact on flow-performance relationship
Panel B: Region Specific

	Asian Pacific		Emerging		Europe		North America		Off-Shore	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Perf.	0.00999***	0.01059***	0.00940***	0.01221***	0.01891***	0.01937***	0.02630***	0.02698***	0.02632***	0.02739***
	(9.55)	(9.21)	(5.59)	(5.66)	(31.70)	(25.91)	(23.53)	(20.03)	(16.93)	(13.48)
Performance * M.P.R - 12month - top quintile		0.00134		-0.00133		0.00034		0.00701*		0.00087
		(0.57)		(-0.27)		(0.20)		(1.69)		(0.18)
Perf. * M.P.R - 12month - bottom quintile		-0.00306		-0.0104***		-0.00197		-0.00624**		-0.00429
		(-1.26)		(-2.74)		(-1.48)		(-2.22)		(-1.18)
M.P.R - 12month - top quintile	-0.00251**	-0.00320*	-0.00261	-0.00189	-0.0066***	-0.0067***	0.00583**	0.00140	-0.0138***	-0.0142***
	(-2.34)	(-1.91)	(-1.26)	(-0.76)	(-5.96)	(-5.16)	(2.04)	(0.37)	(-4.64)	(-4.05)
M.P.R - 12month - bottom quintile	0.00098	0.00254*	-0.00116	0.00426	0.00289***	0.00385***	-0.00149	0.00163	0.00256*	0.00470**
	(0.82)	(1.69)	(-0.54)	(1.63)	(4.18)	(4.28)	(-0.56)	(0.51)	(1.90)	(2.49)
Log Size	-0.00043**	-0.00043**	-0.0014***	-0.0014***	-0.0008***	-0.0008***	-0.0008***	-0.0008***	-0.0015***	-0.0015***
	(-2.49)	(-2.52)	(-3.82)	(-3.84)	(-7.24)	(-7.27)	(-5.34)	(-5.44)	(-7.22)	(-7.18)
Log Family Size	0.00047***	0.00047***	0.00086***	0.00086***	0.00029***	0.00029***	0.00043***	0.00042***	0.00129***	0.00130***
	(3.33)	(3.34)	(3.39)	(3.39)	(3.66)	(3.64)	(3.87)	(3.80)	(7.69)	(7.68)
Log Age	-0.0049***	-0.0049***	-0.00167	-0.00180	-0.0029***	-0.0029***	-0.0082***	-0.0082***	-0.0041***	-0.0041***
	(-6.33)	(-6.33)	(-1.39)	(-1.49)	(-12.94)	(-12.93)	(-21.31)	(-21.33)	(-9.37)	(-9.37)
Fees	-0.40842	-0.41519	-0.12302	-0.09701	-0.8017***	-0.8035***	1.30042**	1.30892**	0.05657	0.05735
	(-1.05)	(-1.06)	(-0.19)	(-0.15)	(-3.48)	(-3.48)	(2.06)	(2.08)	(0.15)	(0.15)
Flow	0.23619***	0.23614***	0.22097***	0.22066***	0.11233***	0.11231***	0.13806***	0.13769***	0.13707***	0.13704***
	(13.33)	(13.33)	(16.09)	(16.08)	(24.02)	(24.01)	(10.68)	(10.65)	(21.81)	(21.80)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.078	0.079	0.081	0.081	0.030	0.031	0.056	0.056	0.040	0.040
Number of observation	142148	142148	59226	59226	622662	622662	210440	210440	295202	295202

Table 6 – Benchmark Return **- Impact on flow-performance relationship**
Panel A: **All Countries and Country Specific**

	All Countries		Non-US		US	
	(1)	(2)	(3)	(4)	(5)	(6)
Performance	0.01770***	0.01727***	0.01668***	0.01609***	0.02385***	0.02408***
	(43.14)	(32.02)	(37.55)	(27.63)	(24.04)	(20.81)
Performance * M.P.R - 12month - top quintile		-0.00845***		-0.01019***		0.00092
		(-8.74)		(-9.78)		(0.49)
Performance * M.P.R - 12month - bottom quintile		0.00309***		0.00332***		0.00267*
		(4.75)		(5.06)		(1.81)
M.P.R - 12month - top quintile	-0.00588***	0.00514***	-0.00750***	0.00541***	0.00184	0.00170
	(-6.97)	(4.36)	(-8.55)	(4.31)	(1.22)	(0.75)
M.P.R - 12month - bottom quintile	0.00227***	-0.00168**	0.00270***	-0.00126	0.00147	-0.00227
	(3.87)	(-1.97)	(4.65)	(-1.39)	(1.35)	(-1.09)
Log Size	-0.00100***	-0.00100***	-0.00095***	-0.00095***	-0.00108***	-0.00108***
	(-13.88)	(-13.92)	(-12.25)	(-12.28)	(-4.65)	(-4.65)
Log Family Size	0.00076***	0.00076***	0.00077***	0.00077***	0.00067***	0.00066***
	(12.77)	(12.76)	(11.59)	(11.60)	(3.85)	(3.81)
Log Age	-0.00448***	-0.00447***	-0.00400***	-0.00399***	-0.00858***	-0.00858***
	(-24.70)	(-24.63)	(-20.99)	(-20.90)	(-14.58)	(-14.57)
Fees	-0.69956***	-0.70258***	-0.78808***	-0.79274***	-0.36367	-0.36534
	(-3.93)	(-3.95)	(-4.26)	(-4.29)	(-0.45)	(-0.45)
Flow	0.12724***	0.12714***	0.12063***	0.12054***	0.18962***	0.18956***
	(38.20)	(38.20)	(34.73)	(34.73)	(12.63)	(12.62)
Country fixed effects	Yes	Yes	Yes	Yes	No	No
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.033	0.033	0.030	0.030	0.074	0.074
Number of observations	1447830	1447830	1304835	1304835	142995	142995

Table 12 – Benchmark Return - Impact on flow-performance relationship

Panel B: Region Specific

	Asian Pacific		Emerging		Europe		North America		Off-Shore	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Perf.	0.00587***	0.00399***	0.00663***	0.00756***	0.01638***	0.01605***	0.02251***	0.02250***	0.02632***	0.02671***
	(7.09)	(3.85)	(4.62)	(3.83)	(31.98)	(24.99)	(27.98)	(20.96)	(25.44)	(20.02)
Perf. * M.P.R - 12month - top quintile		-0.0051***		-0.00253		-0.0089***		0.00815***		-0.0169***
		(-3.61)		(-0.99)		(-6.90)		(3.12)		(-5.18)
Perf * M.P.R - 12month - bottom quintile		-0.00044		0.00095		0.00392***		0.00155		0.00534***
		(-0.32)		(0.43)		(4.59)		(0.60)		(3.95)
M.P.R - 12month - top quintile	-0.00213***	0.00583***	-0.00324	-0.00147	-0.0070***	0.00395***	0.01125***	0.00584***	-0.0138***	0.00623*
	(-2.10)	(2.66)	(-1.58)	(-0.34)	(-6.28)	(3.15)	(4.40)	(2.33)	(-4.66)	(1.85)
M.P.R - 12month - bottom quintile	0.00187	0.00487***	-0.00021	-0.00243	0.00314***	-0.00161	0.00007	-0.00302	0.00270*	-0.0053***
	(1.55)	(2.72)	(-0.11)	(-0.83)	(4.53)	(-1.42)	(0.03)	(-1.54)	(1.92)	(-2.76)
Log Size	-0.0006***	-0.0006***	-0.0012***	-0.0012***	-0.0010***	-0.0010***	-0.0009***	-0.0009***	-0.0013***	-0.0013***
	(-3.66)	(-3.69)	(-3.54)	(-3.53)	(-9.15)	(-9.18)	(-5.86)	(-5.92)	(-6.50)	(-6.53)
Log Family Size	0.00042***	0.00042***	0.00106***	0.00106***	0.00058***	0.00057***	0.00065***	0.00064***	0.00126***	0.00126***
	(3.07)	(3.06)	(4.31)	(4.29)	(6.89)	(6.88)	(6.10)	(6.05)	(7.78)	(7.78)
Log Age	-0.0053***	-0.0053***	-0.00186	-0.00188	-0.0034***	-0.0034***	-0.0081***	-0.0081***	-0.0042***	-0.0042***
	(-6.93)	(-6.88)	(-1.58)	(-1.60)	(-14.86)	(-14.83)	(-20.71)	(-20.71)	(-9.48)	(-9.47)
Fees	-1.3804***	-1.3584***	-0.28719	-0.29257	-1.9274***	-1.9320***	1.74660***	1.75825***	0.33091	0.31337
	(-3.67)	(-3.61)	(-0.45)	(-0.46)	(-8.53)	(-8.55)	(3.12)	(3.14)	(0.89)	(0.84)
Flow	0.21603***	0.21584***	0.21791***	0.21790***	0.09624***	0.09618***	0.12893***	0.12878***	0.13186***	0.13166***
	(12.66)	(12.66)	(16.18)	(16.17)	(23.30)	(23.29)	(12.16)	(12.14)	(22.09)	(22.12)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.070	0.070	0.078	0.078	0.024	0.024	0.045	0.045	0.037	0.037
Number of observations	153757	153757	61840	61840	680382	680382	239215	239215	312636	312636

Table 7 - Raw Return **- Impact on the sensitivity of the flow-performance relationship**
All Countries, Region and Country Specific

	All Countries	Asian Pacific	Emerging	Europe	North America	Off-Shore	Non-US	US
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Low Perf.	0.02575***	0.00384	0.00445	0.02814***	0.04581***	0.02363***	0.02049***	0.05090***
	(10.63)	(0.63)	(0.43)	(8.35)	(9.51)	(3.67)	(8.08)	(8.59)
Low Perf. * M.P.R - 12month - top quintile	0.01714***	0.00480	0.02576	0.01496**	-0.00645	0.05117***	0.02373***	-0.04522***
	(3.16)	(0.35)	(1.40)	(2.18)	(-0.49)	(3.12)	(4.26)	(-3.43)
Low Perf. * M.P.R - 12month - bot quintile	-0.01157**	-0.01227	-0.03214	-0.00032	-0.02873**	-0.01303	-0.00611	-0.04356***
	(-2.38)	(-0.94)	(-1.53)	(-0.05)	(-2.30)	(-1.11)	(-1.22)	(-4.05)
Mid Perf.	0.01466***	0.00919***	0.00400	0.01279***	0.01780***	0.02050***	0.01524***	0.01753***
	(19.69)	(6.26)	(1.33)	(13.57)	(10.74)	(9.84)	(19.24)	(11.14)
Mid Perf. * M.P.R - 12month - top quintile	0.00008	-0.00129	0.00913	0.00093	0.00260	-0.00244	-0.00128	0.00414
	(0.05)	(-0.35)	(1.31)	(0.46)	(0.63)	(-0.65)	(-0.77)	(1.20)
Mid Perf. * M.P.R - 12month - bot quintile	-0.00180	-0.00381	-0.00574	-0.00182	-0.00060	-0.00143	-0.00329**	0.00246
	(-1.33)	(-1.33)	(-0.88)	(-1.05)	(-0.19)	(-0.43)	(-2.33)	(0.91)
Top Perf.	0.06380***	0.02797***	0.07564***	0.06068***	0.07498***	0.08374***	0.06088***	0.07932***
	(17.32)	(3.52)	(5.00)	(12.73)	(9.26)	(7.83)	(15.83)	(9.23)
Top Perf. * M.P.R - 12month - top quintile	-0.00619	0.01506	-0.1120***	-0.02044**	0.03153*	-0.02263	-0.01710**	0.02306*
	(-0.78)	(0.98)	(-3.22)	(-2.04)	(1.69)	(-1.00)	(-2.09)	(1.65)
Top Perf. * M.P.R - 12month - bot quintile	-0.01056*	0.00851	-0.01778	-0.00576	-0.02375*	-0.01708	-0.00705	-0.02940**
	(-1.65)	(0.67)	(-0.60)	(-0.67)	(-1.73)	(-0.92)	(-1.03)	(-2.20)
M.P.R - 12month - top q.	-0.00895***	-0.00339	-0.00654**	-0.0091***	0.00471	-0.0218***	-0.0108***	0.00915***
	(-7.05)	(-1.58)	(-2.06)	(-5.70)	(1.11)	(-4.90)	(-8.20)	(3.63)
M.P.R - 12month - bot q.	0.00455***	0.00412*	0.00707**	0.00356***	0.00447	0.00569**	0.00454***	0.01064***
	(4.48)	(1.65)	(2.10)	(2.93)	(1.18)	(2.24)	(4.49)	(5.10)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Adjusted R-squared	0.041	0.079	0.082	0.031	0.057	0.041	0.037	0.111
Number of observations	1329678	142148	59226	622662	210440	295202	1208844	120834

Table 8 - Benchmark Return **- Impact on the sensitivity of the flow-performance relationship**
All Countries, Region and Country Specific

	All Countries	Asian Pacific	Emerging	Europe	North America	Off-Shore	Non-US	US
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Low Perf.	0.02360***	-0.00738	-0.00655	0.03474***	0.03556***	0.01607***	0.02194***	0.03281***
	(10.03)	(-1.24)	(-0.70)	(10.36)	(5.94)	(3.10)	(9.03)	(4.15)
Low Perf. * M.P.R - 12month - top quintile	0.00734	-0.00532	0.03147**	0.00659	-0.03950**	0.02192*	0.01249**	-0.04396***
	(1.44)	(-0.43)	(2.07)	(0.95)	(-2.37)	(1.90)	(2.40)	(-2.61)
Low Perf. * M.P.R - 12month - bot quintile	-0.00764*	0.02743***	0.00500	-0.00870	-0.01797*	-0.01355	-0.00471	-0.02711**
	(-1.78)	(2.98)	(0.35)	(-1.44)	(-1.65)	(-1.29)	(-1.05)	(-2.08)
Mid Perf.	0.01171***	0.00447***	0.01138***	0.00975***	0.01410***	0.02008***	0.01115***	0.01546***
	(19.19)	(3.47)	(3.78)	(11.37)	(11.05)	(14.84)	(16.75)	(10.28)
Mid Perf. * M.P.R - 12month - top quintile	0.00440***	0.00470*	-0.00648	0.00348**	0.01062***	0.00283	0.00380***	0.00851**
	(3.58)	(1.71)	(-0.99)	(2.24)	(3.71)	(0.98)	(2.95)	(2.41)
Mid Perf. * M.P.R - 12month - bot quintile	-0.00092	0.00171	-0.00637	-0.00177	0.00079	-0.00267	-0.00129	0.00278
	(-0.84)	(0.69)	(-1.24)	(-1.18)	(0.32)	(-1.02)	(-1.10)	(1.00)
Top Perf.	0.05260***	0.01201*	-0.00424	0.04388***	0.07217***	0.08814***	0.04769***	0.07401***
	(15.63)	(1.75)	(-0.35)	(10.31)	(8.93)	(9.69)	(13.58)	(9.12)
Top Perf. * M.P.R - 12month - top quintile	0.00788	0.02233	-0.00248	0.00414	0.00432	0.01842	0.00987	-0.00994
	(1.15)	(1.43)	(-0.10)	(0.52)	(0.25)	(0.90)	(1.35)	(-0.60)
Top Perf. * M.P.R - 12month - bot quintile	-0.00061	0.00708	0.01788	0.00671	-0.01473	-0.01637	0.00266	-0.01032
	(-0.10)	(0.51)	(0.64)	(0.79)	(-1.10)	(-1.17)	(0.42)	(-0.61)
M.P.R - 12month - top q.	-0.00866***	-0.00301	-0.00680**	-0.00927***	0.01493***	-0.01902***	-0.01105***	0.00734**
	(-6.97)	(-1.38)	(-2.22)	(-5.66)	(3.90)	(-5.14)	(-8.67)	(2.32)
M.P.R - 12month - bot q.	0.00393***	-0.00363*	0.00031	0.00507***	0.00342	0.00630***	0.00387***	0.00597**
	(4.54)	(-1.91)	(0.12)	(4.56)	(1.10)	(2.89)	(4.39)	(2.50)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Adjusted R-squared	0.034	0.070	0.078	0.024	0.046	0.038	0.030	0.075
Number of observations	1447830	153757	61840	680382	239215	312636	1304835	142995

Table 9 – 4 factor-alpha Return- **Impact on the sensitivity of the flow-performance relationship (country specific)**

All Countries, Regions and Country Specific

	All Countries	Asian Pacific	Emerging	Europe	North America	Off-Shore	Non-US	US
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Low Perf.	0.02477***	-0.00056	0.00072	0.03563***	0.03352***	0.021***	0.0229***	0.0294***
	(10.48)	(-0.10)	(0.07)	(10.82)	(6.01)	(3.43)	(9.38)	(4.38)
Low Perf. * M.P.R - 12month - top quintile	0.00517	-0.00442	0.02472	-0.00045	0.00312	0.02278*	0.00745	-0.00083
	(1.06)	(-0.43)	(1.50)	(-0.06)	(0.31)	(1.75)	(1.45)	(-0.06)
Low Perf. * M.P.R - 12month - bot quintile	-0.00975**	0.00567	-0.02404	-0.00975	-0.01709*	-0.00507	-0.00599	-0.037***
	(-2.10)	(0.45)	(-1.17)	(-1.48)	(-1.74)	(-0.45)	(-1.23)	(-3.24)
Mid Perf.	0.01360***	0.00981***	0.00769**	0.00949***	0.01829***	0.021***	0.0133***	0.0205***
	(20.11)	(7.05)	(2.44)	(11.05)	(13.77)	(12.69)	(18.38)	(11.58)
Mid Perf. * M.P.R - 12month - top quintile	-0.00266*	-0.00344	-0.00853	-0.00099	0.00131	-0.00284	-0.0031**	-0.00623*
	(-1.88)	(-1.09)	(-1.37)	(-0.55)	(0.43)	(-0.85)	(-2.07)	(-1.72)
Mid Perf. * M.P.R - 12month - bot quintile	-0.00289**	-0.00820***	-0.00873	-0.00097	-0.00517**	-0.00165	-0.0033**	-0.00521*
	(-2.19)	(-2.65)	(-1.40)	(-0.59)	(-2.16)	(-0.52)	(-2.31)	(-1.76)
Top Perf.	0.04824***	0.01174*	0.05408***	0.04776***	0.06244***	0.0576***	0.0450***	0.05938***
	(15.27)	(1.74)	(4.13)	(10.62)	(8.75)	(7.04)	(13.85)	(6.91)
Top Perf. * M.P.R - 12month - top quintile	-0.00535	0.02015*	-0.03332	-0.02066**	0.01412	-0.00879	-0.00975	0.00762
	(-0.80)	(1.74)	(-1.14)	(-2.50)	(0.74)	(-0.45)	(-1.42)	(0.49)
Top Perf. * M.P.R - 12month - bot quintile	0.00320	0.03063***	-0.00826	0.01120	-0.00998	-0.00349	0.00632	-0.00225
	(0.57)	(2.78)	(-0.28)	(1.33)	(-0.76)	(-0.26)	(1.08)	(-0.17)
M.P.R - 12month - top quintile	-0.00609***	-0.00124	-0.00410	-0.00595***	0.00443	-0.018***	-0.008***	-0.00074
	(-5.29)	(-0.58)	(-1.30)	(-3.68)	(1.24)	(-4.64)	(-6.26)	(-0.27)
M.P.R - 12month - bot quintile	0.00442***	0.00129	0.00706*	0.00478***	0.00553	0.00445*	0.004***	0.0094***
	(4.63)	(0.53)	(1.91)	(3.79)	(1.63)	(1.77)	(4.44)	(4.71)
Log GDP per capita	-0.00392	-0.00077	-0.01756	-0.00100	-0.03137	-0.02686	-0.0060**	0.1488***
	(-1.59)	(-0.20)	(-1.54)	(-0.24)	(-1.64)	(-1.56)	(-2.55)	(5.19)
Log fund industry size	-0.00043	-0.00294	0.00292	0.00041	0.00844	0.00771*	0.00054	0.0229***
	(-0.53)	(-1.27)	(0.86)	(0.34)	(1.51)	(1.69)	(0.57)	(8.77)
Fund industry Herfindhal	0.00421	-0.00329	-0.03181	0.00009	0.07859	0.07998	-0.00383	-3.746***
	(0.56)	(-0.28)	(-1.01)	(0.01)	(1.55)	(0.77)	(-0.48)	(-14.90)
Political stability	-0.00143	0.00527	-0.01195*	0.00492**	-0.03151***	0.01110	0.00227	0.1344***
	(-0.89)	(0.96)	(-1.95)	(2.01)	(-2.74)	(0.87)	(1.18)	(13.69)
Regulation quality	-0.00095	-0.01275***	0.00641	-0.00258	0.00014	-0.00495	-0.00151	-0.062***
	(-0.47)	(-2.70)	(0.83)	(-0.85)	(0.03)	(-0.42)	(-0.68)	(-3.65)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.034	0.075	0.079	0.024	0.048	0.036	0.031	0.077
Number of observations	1464093	157009	62436	688813	240793	315042	1319905	144188

This table presents the results of the regressions, detailed in equation 6 on Section 4, which investigates the influence that the top and bottom quintiles of the 12-month moving average of the country specific policy rate variations have on the sensitivity of the flow-performance relationship when we include a set of country-specific variables. The performance distribution is duly divided onto quintiles, and follows the rationale described in equation 6 (Section 4). The control variables included are described in section 4 and, more briefly, in Appendix 1. Robust t-statistics clustered by the month and country are reported in parentheses. p-values in parentheses; *, ** and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 10 – Four-factor Alpha Return **- 3 month vs 12 month policy rate effect on flows**
Panel A: **All Countries and Country Specific**

	All Countries		Non-US		US	
	(1)	(2)	(3)	(4)	(5)	(6)
Performance	0.01733***	0.01734***	0.01649***	0.01646***	0.02395***	0.02401***
	(39.24)	(39.18)	(34.53)	(34.43)	(24.43)	(24.47)
Policy Rate - 3month - top quintile	-0.00306***		-0.00401***		0.00311**	
	(-3.71)		(-4.49)		(2.11)	
Policy Rate - 3month - bottom quintile	0.00029		0.00069		-0.00087	
	(0.47)		(1.10)		(-0.63)	
Policy Rate - 12month - top quintile		-0.00609***		-0.00749***		0.00153
		(-7.26)		(-8.49)		(1.03)
Policy Rate - 12month - bottom quintile		0.00184***		0.00241***		0.00115
		(3.12)		(4.16)		(1.09)
Log Size	-0.00093***	-0.00092***	-0.00090***	-0.00088***	-0.00092***	-0.00092***
	(-13.03)	(-13.00)	(-11.65)	(-11.56)	(-3.96)	(-3.96)
Log Family Size	0.00081***	0.00081***	0.00082***	0.00083***	0.00074***	0.00074***
	(13.53)	(13.57)	(12.41)	(12.44)	(4.28)	(4.28)
Log Age	-0.00467***	-0.00468***	-0.00419***	-0.00419***	-0.00876***	-0.00876***
	(-25.65)	(-25.74)	(-21.87)	(-21.95)	(-14.94)	(-14.95)
Fees	-0.86127***	-0.86848***	-0.92488***	-0.91868***	-0.41969	-0.41489
	(-4.87)	(-4.91)	(-5.02)	(-4.99)	(-0.52)	(-0.51)
Flow	0.12818***	0.12763***	0.12200***	0.12124***	0.18812***	0.18808***
	(38.33)	(38.22)	(34.90)	(34.78)	(12.56)	(12.56)
Country fixed effects	Yes	Yes	Yes	Yes	No	No
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.033	0.034	0.030	0.030	0.074	0.074
Number of observations	1464093	1464093	1319905	1319905	144188	144188

This table presents the results of the regression described in equation 4 focusing on the top and bottom quintiles of the 12-month and 3-month policy rate variable. The table is then divided in Panel A: including the results for All countries, Non-US and US; and Panel B: including the results for all different regions. The control variables included are described in section 4 and, more briefly, in Appendix 1. Robust t-statistics clustered by the month and country are reported in parentheses. p-values in parentheses; *, ** and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 16 – **Four-factor Alpha Return** - 3 month vs 12 month policy rate effect on flows
Panel B: Region Specific

	Asian Pacific		Emerging		Europe		North America		Off-Shore	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Perf	0.00812***	0.00811***	0.00865***	0.00855***	0.01550***	0.01549***	0.02414***	0.02386***	0.02427***	0.02429***
	(8.17)	(8.29)	(5.38)	(5.30)	(29.77)	(29.79)	(27.20)	(27.01)	(19.06)	(19.09)
M.P.R - 3month - top quintile	-0.00165		-0.00397		-0.00160		0.00442**		-0.00239	
	(-1.26)		(-1.21)		(-1.64)		(2.04)		(-0.63)	
M.P.R - 3month - bottom quintile	-0.00023		0.00323		0.00111		0.00105		0.00057	
	(-0.19)		(0.93)		(1.37)		(0.45)		(0.39)	
M.P.R - 12month - top quintile		-0.00252**		-0.00266		-0.00697***		0.00855***		-0.01384***
		(-2.52)		(-1.30)		(-6.22)		(3.24)		(-4.65)
M.P.R - 12month - bottom quintile		0.00100		-0.00055		0.00304***		0.00002		0.00257*
		(0.86)		(-0.27)		(4.33)		(0.01)		(1.84)
Log Size	-0.00051***	-0.00050***	-0.00118***	-0.00124***	-0.00098***	-0.00097***	-0.00081***	-0.00081***	-0.00124***	-0.00122***
	(-3.11)	(-3.09)	(-3.48)	(-3.59)	(-8.91)	(-8.86)	(-5.43)	(-5.48)	(-6.53)	(-6.57)
Log Family Size	0.00046***	0.00047***	0.00102***	0.00102***	0.00062***	0.00063***	0.00072***	0.00071***	0.00140***	0.00141***
	(3.30)	(3.35)	(4.16)	(4.17)	(7.53)	(7.53)	(6.98)	(6.73)	(8.66)	(8.66)
Log Age	-0.00541***	-0.00541***	-0.00236**	-0.00191	-0.00356***	-0.00352***	-0.00828***	-0.00832***	-0.00434***	-0.00436***
	(-7.12)	(-7.02)	(-2.02)	(-1.63)	(-15.39)	(-15.30)	(-21.42)	(-21.34)	(-9.65)	(-9.81)
Fees	-1.39932***	-1.38994***	-0.28002	-0.30675	-2.07721***	-2.05346***	1.36016**	1.30480**	-0.00511	0.01176
	(-3.71)	(-3.69)	(-0.44)	(-0.48)	(-9.20)	(-9.11)	(2.52)	(2.37)	(-0.01)	(0.03)
Flow	0.22499***	0.22485***	0.21578***	0.21680***	0.09682***	0.09605***	0.12804***	0.12773***	0.13362***	0.13214***
	(13.39)	(13.37)	(16.10)	(16.14)	(23.16)	(23.08)	(12.10)	(12.06)	(22.14)	(22.04)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.074	0.074	0.078	0.078	0.023	0.024	0.046	0.047	0.035	0.036
Number of observations	157009	157009	62436	62436	688813	688813	240793	240793	315042	315042