Investor protection

Use of derivatives by UCITS equity funds

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We investigate the use of derivatives by EU UCITS equity funds, based on regulatory data on derivatives collected under the EU EMIR framework. Our results indicate that the tendency and frequency of EU UCITS equity funds to trade derivatives is to a large extent embedded in asset managers' characteristics, such as fund family and fund family size. On the contrary, we find that on the individual fund level the investment strategy, size, geographic focus, base currency, or domicile of the fund play a minor role. Over time, cash inflows as well as currency risk seem to have a significant and robust influence, which suggests that derivatives are used for transaction cost or risk reduction purposes. Our analysis does not find strong indications that derivatives are primarily used for speculative or window-dressing purposes by UCITS equity funds.

Introduction

After the financial crisis in 2008, global regulators started to shed more light on derivatives markets, including the use of derivatives by market participants. Under various regulatory frameworks (such as EMIR in the EU) derivatives transactions are reported to the authorities, enabling a granular analysis of derivatives transactions. In this article EMIR data is used to foster the understanding of derivatives usage by EU equity investment funds.

ESMA (2018) gives a broad overview of the EU derivatives market and shows that investment firms and credit institutions are the main participants in derivatives markets. They account for more than 95% of trading activity in notional terms. Alternative investment funds seem to be active mostly in credit derivatives (around 6% of the market notional amount) and interest rate derivatives markets (around 3% of the market notional amount). UCITS funds are minor players in the derivatives market. Their exposure is higher than 2% of the total notional amount only in the credit and equity derivatives segments. While UCITS make up a relatively small portion of the overall EU derivatives market, the estimate is based on gross amounts. A gross measure might underestimate the market share of UCITS compared to a net measure (Braunsteffer et al. 2019).

In this article we focus on equity funds, which represent 37% of the EU UCITS net assets.[124] We analyse (i) what types of derivatives are traded by UCITS equity funds, (ii) why some UCITS equity funds trade derivatives, while others do not, (iii) what makes some of them more active traders, and (iv) to what extent derivatives trading is a reaction to daily changes in fund and market conditions. While there is some literature dealing with (i) and (ii), research on (iii) and (iv) is currently still very limited.

We contribute to the literature on derivatives use by investment funds in multiple ways. First, we complement previous evidence on which types of derivatives equity funds use (e.g. Fong et al., 2005; Cao et al., 2011; Cici and Palacios, 2015; Natter et al., 2016). This article shows that three types of contracts (forward, futures and options) account for about 80% of all trades.

Second, we add to the literature on which funds are using derivatives. Previous literature has documented various characteristics of funds which trade derivatives (e.g. Cao, Ghysels and Hatheway, 2011; Cici and Palacios, 2015; Deli and Varma, 2002; Guagliano et al., 2019; Koski and Pontiff, 1999; Johnson and Yu, 2004; Natter et al., 2016). We emphasise the role of the management company of the fund (also called "fund family") in a fund's decision to use derivatives.

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[124] See https://www.efama.org/Publications/Statistics/Quarterly/Quarterly%20Statistical%20Reports/190308_Quarterly%20Statistical%20Release%20Q4%202018.pdf

Data

To identify the sample of funds for our analysis we use data from the Morningstar Direct database. The sample construction starts with all UCITS funds classified as equity funds, domiciled in the EU, with an inception date before or equal to 31 December 2015. Furthermore, we exclude funds with missing information on the ISIN or the benchmark. In line with related papers (e.g. Natter et al., 2016), we exclude funds with a net asset value below 5mn USD (converted from the original currency) to deal with the incubation bias (Evans, 2010). These criteria are fulfilled by 5,038 equity funds.

The UCITS equity fund sample is then merged to the derivatives dataset coming from EMIR. In EMIR data, counterparties of a derivative trade are identified by the Legal Entity Identifier (LEI). We follow Braunsteffer et al. (2019) to link fund data (identified by ISIN) with EMIR data (identified by LEI).

Data originating from EMIR are provided to the authorities at different levels of granularity. The highest level of granularity is trade activity (also referred to as flow data), which provides various messages to update the status of open transactions. Each message has a certain action type that defines the content and consequently the status of the transaction (e.g. new trade, modified, cancelled/terminated; ESMA, 2018).

For our investigation, we use trade activity data from 1 July to 31 December 2016, which is collected from the six relevant Trade Repositories (TRs) in 2016 (i.e. CME, DTCC, ICE, KDPW, Regis-TR and UnaVista). We filter out only new transactions. EMIR data provide a variety of fields to describe the complex universe of derivative transactions. We extract the main EMIR fields to identify the central properties of these contracts: asset class, contract type, counterparty side (buy/sell), and notional amount.[125] Further, we apply various cleaning steps to filter out unrealistic or unexpected values.

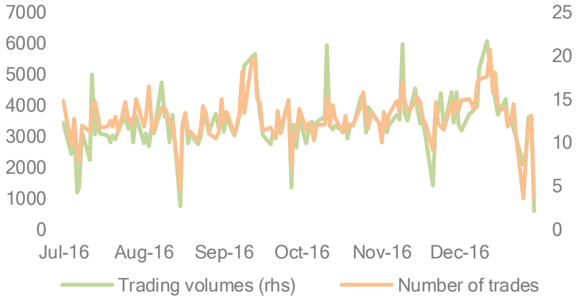
Using our Morningstar sample, 1,388 of the 5,038 equity funds are identified in the EMIR data, i.e. 27.6% of the equity funds make at least one derivative trade in the analysed period. As a result, our sample includes 181,746 fund-day observations.

We construct the following three different aggregated measures at a fund-day level: (i) a derivative trading dummy equal to one if a fund trades a derivative on a certain day and zero otherwise; (ii) the number of trades per day; (iii) the traded notional amount per day. Considering only the funds trading derivatives, we find that on average each fund trades on 40% of the days and makes about 2.6 trades per day when it trades.

Derivatives use by equity funds

Trade activity data from EMIR allows possible trading patterns over time to be identified and the shedding of light on underlying asset classes and used derivative types. In the period from 1 July to 31 December 2016, the 1,388 funds make 472,757 trades. As expected, the number of trades and the trading volume are highly correlated. Over our sample period, we do not observe a clear time trend in funds' daily trading activities. Rather, we observe several peaks in both the number of trades and the trading volume (V.33).

V.33
Derivatives trading of funds
No systematic trading pattern over time



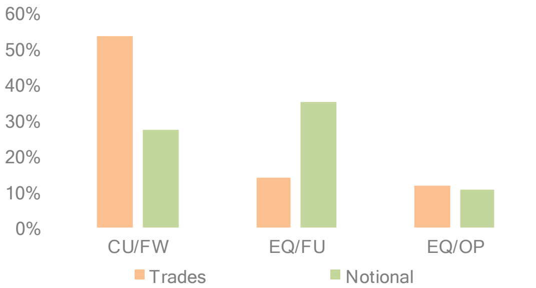
Note: Total number of derivatives transactions reported under EMIR, and gross notional amounts traded (right axis), EUR bn.
Sources: TRs, ESMA.

Three types of contract account for almost 80% of all trades, with forward contracts on currencies being responsible for 53% and future or option contracts on equities for 26% together (14% and 12%, respectively). In terms of the relative distribution of the notional amount of trades, these three types of contract still account for 72%. However, the relative importance changes. While the portion of forward contracts on currencies decreases to 27%, the share of future equity contracts increases to 35%. This shows that on average the notional amount of futures used in funds is higher than for forwards which could be

125 For the exchange-traded derivatives, the reporting of asset class and contract type is not standardised, thus we use a methodology developed and tested by ESMA to populate this information.

driven by the design of these contracts. Options on equity remain almost unchanged with 10% (V.34).

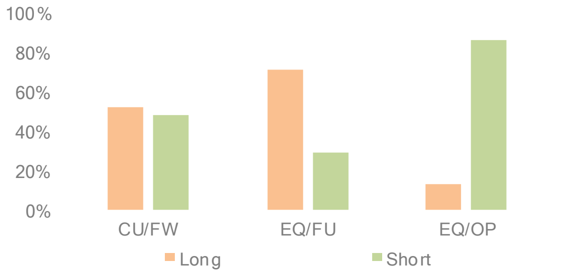
V.34
Derivatives contract types
Concentrated around three contract types



Note: Share of the top 3 derivatives contracts, in % of all derivatives trades and total notional. CU/FW=currency forwards; EQ/FU=equity futures; EQ/OP=equity options.
Sources: TRs, ESMA.

Forward trades on currencies are almost equally balanced across long and short trades (52% to 48%). For futures on equities, long trades are dominating, with 71% indicating that they aim to mirror direct exposure to the underlying. By contrast, equity UCITS funds write an option to receive a premium in 87% of the trades (V.35), which potentially shows the usage of covered call strategies.

V.35
Share of long and short positions for the main contract types
Different patterns across contract types



Note: Share of long and short positions for the top 3 derivatives contracts, in % of trades in each contract. CU/FW=currency forwards; EQ/FU=equity futures; EQ/OP=equity options.
Sources: TRs, ESMA.

Empirical approach

Which equity funds use derivatives?

To provide insights into an equity fund's decision to use derivatives or not, we analyse the role of the fund family and the fund's characteristics. Technically, we use the following regression model.

$$Derivatives_i = \alpha + \lambda_{family\ size} + \lambda_{family} + \lambda_{invarea} + \lambda_{currency} + \lambda_{domicile} + \lambda_{benchmark} + \lambda_{size} + \epsilon_i$$

where:

- the dependent variable $Derivatives_i$ is equal to one if the fund is using derivatives and equal to zero otherwise;
- i denotes a fund and ε_i is the error term;
- $\lambda_{familysize}$ is fund-family-size-decile fixed effects;
- λ_{family} is fund-family fixed effects;
- $\lambda_{invarea}$ is investment area fixed effects;
- $\lambda_{currency}$ is base-currency fixed effects;
- $\lambda_{domicile}$ is fund-country fixed effects;
- $\lambda_{benchmark}$ is benchmark fixed effects;
- λ_{size} is fund-size-decile fixed effects.

The statistic of interest here is the explanatory power. It indicates which part of the overall variation in funds' decisions to use or not use derivatives can be explained by these characteristics.

According to previous results in the literature, we expect the geographic investment focus as measured by the investment area, the investment strategy as measured by the benchmark as well as the fund's size or the size of the fund family (i.e. the total assets under management of the fund management company) to play an important role.

In the first step, we include variables for the fund family size based on the number of funds belonging to a family. Family size effects can only explain 1.1% of the overall variation. Next, we add fund-family effects to the model. This increases the explanatory power to 25.7%. Hence, a fund's affiliation to a certain fund family can explain a substantial part of the decision to use derivatives or not. Successively, we add further variables for the investment area, base currency, domicile, benchmark, and fund size. Although each of these variables on its own can explain between 2.6% and 5.0% of the overall variation, they are only able to further increase the explanatory power to 29.3%, on top of the fund-family effects (V.36).

V.36
Fund characteristics and the decision to use derivatives
Asset managers drive the decision to use derivatives

	Individual	Combined model	
	Adj. R2	Adj. R2	Obs.
Family size FE	0.011	0.011	5,038
Family FE	0.257	0.257	4,780
Investment Area FE	0.028	0.269	4,775
Currency FE	0.026	0.270	4,772
Domicile FE	0.050	0.272	4,772
Benchmark FE	0.045	0.272	4,359
Fund size FE	0.040	0.293	4,349

Note: Estimates from linear regressions of the derivatives trading dummy (equal to one if a fund makes at least one derivative trade during our sample period) on various fixed effects (FEs). The fixed effects control for size of the fund family, fund family, investment area, currency, domicile, benchmark, and deciles of fund size. They are successively added to the model. The sample consists of derivatives trading and non-derivatives trading funds. We report for each fixed effect the individual adjusted R-squared (from a regression model with only this fixed effect) and the adjusted R-squared of the combined model (with this fixed effect and all fixed effects listed above) as well as the number of observations of the combined model (Obs.).
Sources: ESMA.

How do funds use derivatives?

To analyse the propensity and extent of a fund's derivative use, we aggregate the trade-level data on fund-day level and construct two measures for a fund's daily derivative use:

- $Notional_{i,t}$ is the natural logarithm of the total notional of a fund's derivatives trades on day t;
- $DTD_{i,t}$ is the daily derivatives trading dummy that equals one if a fund *i* makes at least one derivative trade on day t.

We focus on the 1,388 equity funds using derivatives and we analyse which fund characteristics describe a fund that makes active use of derivatives.

$Notional_{i,t}$ and DTD_{it} are the dependent variables of the followed fixed effects approach to identify fund characteristics that can explain the propensity and extent of funds' daily derivative use. In this step we also include fund effects (λ_i).

The relative activity of a fund in derivatives markets depends on the decision of the related asset managers, i.e. the fund family (31.8% of the overall variation in the daily notional). Only a minor part of this (3.1%) relates to the size of the fund family. Investment area, currency, domicile, benchmark, and fund size are minor drivers (they increase the adjusted R- squared to 41.3%). Interestingly, a fund's benchmark seems to be important since it can explain on its own 13.8% of the overall variance. The fund fixed effects further increase the explanatory power to 57.6% (V.37 panel A). The same analysis is run for the derivatives trading dummy that equals one if a fund makes at least one trade on a day. The results are very similar. Together, all fixed effects can explain 53.0% (V.37 panel B).

V.37
Fund characteristics and active derivatives users
Benchmark and fund characteristics explain activity

	Individual	Combined model	
	Adj. R2	Adj. R2	Obs.
Panel A: Notional per day			
Family size FE	0.031	0.031	181,746
Family FE	0.318	0.318	181,746
Investment Area FE	0.032	0.332	181,746
Currency FE	0.024	0.333	181,746
Domicile FE	0.027	0.340	181,746
Benchmark FE	0.138	0.395	181,746
Fund size FE	0.064	0.413	181,746
Fund FE	0.568	0.576	181,746
Panel B: Daily derivatives trading dummy			
Family size FE	0.035	0.035	181,746
Family FE	0.296	0.296	181,746
Investment Area FE	0.035	0.310	181,746
Currency FE	0.030	0.312	181,746
Domicile FE	0.024	0.319	181,746
Benchmark FE	0.137	0.372	181,746
Fund size FE	0.049	0.383	166,749
Fund FE	0.519	0.530	166,747

Note: Estimates from linear regressions of two dependent variables on various fixed effects. In panel A the dependent variable is the natural logarithm of a fund's traded notional per day. In panel B the dependent variable is the daily derivatives trading dummy which equals to one if a fund makes at least one derivative trade on a day and zero otherwise. The fixed effects (FEs) control for size of the fund family, fund family, investment area, currency, domicile, benchmark, deciles of fund size and fund. They are successively added to the model. The sample consists of derivatives trading funds. We report, for each fixed effect, the individual adjusted R-squared (from a regression model with only this fixed effect) and the adjusted R-squared of the combined model (with this fixed effect and all fixed effects listed above) as well as the number of observations of the combined model (Obs.).
Sources: ESMA.

Is equity funds derivatives use a reaction to changing fund and market conditions?

Finally, we analyse the role of time-varying fund and market characteristics for derivatives trading activities. To test which time-varying characteristics matter, we estimate the following linear probability model:

$$DTD_{i,t} = \alpha + \beta x_{i,t-1} + \lambda_{fund} + \lambda_{invarea} + \lambda_{benchmark} + \epsilon_{it}$$

where DTD_{it} is the daily derivatives trading dummy and the main coefficient of interest is the β on a lagged fund characteristic $x_{i,t-1}$. As fund characteristics x, we follow the literature and test various proxies for fund flows, fund risks, and fund returns. Besides day and fund fixed effects, all models also include investment area-day and benchmark-day fixed effects. These fixed effects control for (unobserved) time-varying characteristics that are relevant to funds in the same investment area (e.g. Europe-wide, worldwide) and with the same benchmark (e.g. MSCI World, DAX).[126]

First, we focus on fund flows. The hypothesis is that funds may use derivatives to manage flows in a cost-efficient way. Results show that net flows are positively related to the probability of using derivatives (technically, a one-standard deviation increase of the net flow increases the probability of a trade by 0.26 percentage points). Positive net flows increase the probability of using derivatives while negative net flows do not seem to be relevant. This finding supports the hypothesis that funds use derivatives to manage inflows (V.38 panel A). A possible explanation could be that funds directly invest inflows using derivatives to minimise the tracking error and to save transaction costs. Further, they can use their reserve for small outflows and might liquidate positions for large outflows.

Second, we analyse the relation between fund risk and the probability to use derivatives. Fund risk is proxied by:

— Currency risk, measured by the rolling one-month standard deviation of the exchange rate of a fund's base currency to EUR. If the base currency is EUR, it is set to zero;
— The rolling one-month standard deviation of the fund return;
— The rolling one-month tracking error.

We find that currency risk raises the probability of a trade by two percentage points (the coefficient is 7.717 and statistically significant at the 1%-level). This suggests that equity funds may use derivatives to manage currency risk. The fund risk measured by the standard deviation of the fund return does not seem to affect the probability of using derivatives. The coefficient on the tracking error is 2.030 and statistically significant at the 5%-level (V.38 panel B).[127]

Third, we analyse the relation between a fund's return and the daily decision to trade a derivative. We consider both the monthly absolute fund return and the monthly relative fund return in comparison to the benchmark. The coefficients are not statistically significant. Hence, there does not seem to be a linear relation between a fund's past performance and the decision to use derivatives (V.38 panel C).

V.38
Fund characteristics and flows, risks and performance
Inflows increase probability of using derivatives

Panel A: Fund flows

	Net flow	Positive net flow	Negative net flow
Flow	0.261*** (3.66)	0.432*** (3.64)	0.168 (1.38)
Day FE	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes
Day * investment area FE	Yes	Yes	Yes
Day * benchmark FE	Yes	Yes	Yes
Observations	145,470	145,470	145,470
Adjusted R2	0.555	0.555	0.555

Panel B: Fund risks

	Currency	Sd(return)	Tracking error
Risk	7.717*** (4.00)	0.872 (0.76)	2.030** (2.35)
Day FE	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes
Day * investment area FE	Yes	Yes	Yes
Day * benchmark FE	Yes	Yes	Yes
Observations	145,346	145,471	130,084
Adjusted R2	0.555	0.555	0.552

Panel C: Fund returns

	Return	Return-benchmark
Return	0.127 (1.36)	0.128 (1.16)
Day FE	Yes	Yes
Fund FE	Yes	Yes
Day * investment area FE	Yes	Yes
Day * benchmark FE	Yes	Yes
Observations	145,471	130,084
Adjusted R2	0.555	0.552

Note: Estimates from linear regressions of the derivatives trading dummy on various fixed effects. This dummy equals one if a fund makes at least one derivative trade during our sample period. In panel A, we use the rolling 5-day net flows (column 1), the rolling 5-day positive net flows (column 2) and the rolling 5-day negative net flows (column 3). In panel B, we look at the rolling one-month currency risk (column 1), the one-month standard deviation of returns (column 2) and the one-month rolling tracking error (column 3). In panel C, we rely on two proxies for the fund performance. These are the rolling one-month fund return (column 1) and the rolling one-month relative return to the benchmark (column 2). All models include day and fund fixed effects. Z-statistics based on Huber/White robust standard errors clustered by firms are presented in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.
Sources: ESMA.

[126] Since our dependent variable is a dummy, we also estimate a conditional logit model as a robustness test. These models only establish a correlation between a lagged fund or market characteristic and a fund's propensity to trade on a certain date. They do not identify a causal relation from the fund characteristic to the use of derivatives. For this, we need an exogenous variation in a fund characteristic or a shock to only some of our funds.

[127] However, we do not obtain a significant estimate if we measure the tracking error over 5, 10, 15 or 30 days. Therefore, we are very careful with interpreting this coefficient.

Conclusion

In this article, we use derivatives data originating from EMIR to shed light on derivative use by equity UCITS funds. In detail, we provide new insights into the following questions: (i) what type of derivatives are traded by mutual funds, (ii) why some of them trade derivatives, while others do not, (iii) what makes some more active traders, and (iv) to what extent is derivatives trading a reaction to daily changes in fund and market conditions.

— Equity funds primarily trade three types of contracts: forwards on currencies (50% of all trades), futures and options on equities (less than 30%).

— The fund management company appears to play a relatively strong role in the decision to use derivatives.

— Once the decision to use derivatives is taken by the relevant asset manager, fund characteristics can explain 56% of the overall variation in a fund's daily traded notional and the propensity to trade.

— It also turns out that the investment strategy (measured by the fund's benchmark) has a predictive power of 14%.

— We find evidence of a positive relation between lagged net positive flows and the use of derivatives suggesting that funds may invest inflows using derivatives (to minimise the tracking error and save transaction costs), and between the lagged currency risk and the use of derivatives, indicating that equity funds may use derivatives to manage currency risk.

Our preliminary results indicate that the tendency and frequency of trading derivatives is to a large extent embedded in asset manager characteristics. On the contrary, the investment strategy, size, geographic focus, base currency, or domicile of the fund play a minor role. Moreover, the results point to equity UCITS funds primarily trading derivatives in order to minimise transaction costs or to mitigate risks.

References

Braunsteffer, A., Guagliano, C., Kenny, O. and Mazzacurati, J. (2019), "Use of credit default swaps by UCITS funds: Evidence from EU regulatory data", ESRB Working Paper No.95.

Cao, C., Ghysels, E., and Hatheway, F. (2011), "Derivatives do affect mutual fund returns: Evidence from the financial crisis of 1998". Journal of Futures Markets, Vol. 31, No.7, pp. 629-658.

Cici, G., and Palacios, L. F. (2015), "On the use of options by mutual funds. Do they know what they are doing?", Journal of Banking and Finance, Vol. 50, pp. 157-168.

Deli, D. N., and Varma, R. (2002), "Contracting in the investment management industry: evidence from mutual funds", Journal of Financial Economics, Vol. 63, No.1, pp. 79-98.

European Securities and Markets Authority (2018), "Annual Statistical Report on EU Derivatives Markets".

Evans, R. B. (2010), "Mutual Fund Incubation", The Journal of Finance, Vol. 65, No.4, pp. 1581-1611.

Fong, K., Gallagher, D. R., and Ng, A. (2005), "The Use of Derivatives by Investment Managers and Implications for Portfolio Performance and Risk", International Review of Finance, Vol. 5, No.1-2, pp. 1-29.

Guagliano, C., J. Mazzacurati and A. Spolaore (2019), "The drivers of the use of CDS by investment funds", ESMA Working Paper (forthcoming)

Koski, J. L. and Pontiff, J. (1999), "How are derivatives used? Evidence from the mutual fund industry", The Journal of Finance, Vol. 54, No.2, pp. 791-816.

Johnson, L. D., and Yu, W. W., (2004) "An analysis of the use of derivatives by the Canadian mutual fund industry", Journal of International Money and Finance, Vol. 23, No.6, pp. 947-970.

Natter, M., Rohleder, M., Schulte, D., and Wilkens, M. (2016), "The benefits of option use by mutual funds", Journal of Financial Intermediation, Vol. 26, April, pp. 142-168.