

# POVERTY TRAPS AND DISASTER INSURANCE IN A BI-LEVEL DECISION FRAMEWORK

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**ABSTRACT.** In this paper we study mechanisms of poverty traps that can occur after large disaster shocks. Our starting point is a stylized deterministic dynamic model with locally increasing returns to scale possibly generating multiple equilibria paths with finite upper equilibrium. The deterministic dynamics is then overlaid by random dynamics where catastrophic events happen at random points of time. The number of events follows a Poisson process, whereas the proportional capital losses (given a catastrophic event) are beta distributed. In a setup with fixed insurance premium per unit of insured capital, a fraction of the capital might be insured, and this fraction may change after each event. We seek for an optimal strategy with respect to the insured fraction. Falling below the unstable equilibrium of the deterministic dynamics introduces the possibility of ending up in a poverty trap after the disaster shocks. We show that the trapping probability (over an infinite time horizon) is equal to one when the stable upper equilibrium of the deterministic dynamics is finite. This is true regardless of the chosen amount of insured capital. Optimization then is done with the expected discounted capital after the next catastrophic event as the objective. Our model may also be useful to assess risk premia and creditworthiness of borrowers when a sequence of shocks at uncertain times and of uncertain size occurs.

**JEL classification:** C 61, C 63, L 10, L 11 and L 13

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# Exchange rates and the global transmission of equity market shocks

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## Abstract

We assess the role played by exchange rates in the propagation of shocks across international equity markets. Using Markov switching copulas, we model dependence between exchange rates and two global equity markets and obtain the Cross-Expected Shortfall and the exchange rate contribution to shock transmission. For emerging Latin American economies (Argentina, Brazil, Chile and Mexico) and two developed markets (Europe and the USA) we document that: (a) the contribution of exchange rates to shock transmission is time varying and asymmetric; and (b) exchange rates diversify (echoes) shocks from abroad for investors based in emerging (developed) economies.

**Keywords:** *Exchange rates; International equity markets; Copulas; Cross-Expected shortfall*

**JEL code:** *C58, F31, G15*

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# Hawkes CARMA(p,q) Models In Ruin Theory

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## Extended abstract <sup>1</sup>

In this paper we propose a new risk model for the dynamics of the capital in an insurance company. The insurance claims are modeled through an Hawkes process with random jump size where the intensity follows a CARMA(p,q) model with a self-exciting effect due to the presence of the counting process as a driving noise. Recent empirical studies have showed that the autocorrelation function of the number of claims has a decreasing trend but it is not strictly monotonic. A standard Hawkes model with exponential kernel for insurance claims developed in Swishchuk et al. (2021) is able to reproduce an exponential monotonic decreasing behaviour of the autocorrelation function. Our model, that can be seen as a generalization of the Hawkes process with exponential kernel, is able to generate a more flexible shape for the autocorrelation function and obtain a more realistic dependence structure observed in the number of claims.

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## Keywords

Hawkes process; Intensity Carma process; Insurance claims.

## References

- [1] A. Swishchuk, R. Zagst, and G. Zeller, *Hawkes processes in insurance: Risk model, application to empirical data and optimal investment*, Insurance Mathematics and Economics (2021).

# Impact of FOMC cycle on market uncertainty: evidence from interest rate derivatives

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## Extended abstract <sup>1</sup>

We investigate how Federal Reserve (Fed) actions influence market uncertainty. We consider two kinds of Fed events: the day of the Federal Open Market Committee (FOMC) meeting – which includes a policy statement, press conference and release of a Summary of Economic Projections – and the day of the FOMC minutes are released – which is typically set 3 weeks after the meeting. Unlike related studies focused on the issue (see, e.g., [1, 4, 3, 2]), we measure market uncertainty by the implied volatility extracted from interest rate options, specifically swaptions. We use 1-month constant maturity volatility for swaptions over tenors ranging from one up to 30 years as they are reflective of how these volatilities are marked by dealers/market-makers and cover only one FOMC meeting/minutes release at a time. We use an event study approach along with extensive graphical analysis to evaluate the impact of Fed actions. The results show that 1-month constant maturity implied volatility increases marginally going into

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these events and falls much more significantly afterwards. Remarkably, the increase and reduction in uncertainty around a meeting is not reducing with increasing tenors, showing that the impact of information release has a similar impact over all horizons ranging from 1 to 30 years. If, on one side, this evidence witnesses the capacity of the central bank to control the long end of the curve, on the other it indicates the possibility that overreaction to news may generate the puzzling excess volatility which is observed in long term rates.

### **Keywords**

FOMC cycle; monetary policy; swaption; implied volatility.

### **References**

- [1] Ramaprasad Bhar, Carl Chiarella, Expectations of monetary policy in Australia implied by the probability distribution of interest rate derivatives, *European Journal of Finance*, **6**(2000), 113–125.
- [2] Sami Vähämaa, Option-implied asymmetries in bond market expectations around monetary policy actions of the ECB, *Journal of Economics and Business*, **57**(2005), 23–28.
- [3] Arunima Sinha, FOMC forward guidance and investor beliefs, *American Economic Review*, **105**(2015), 656–661.
- [4] Jaqueline Terra Moura Marins, José Valentim Machado Vicente, Do the central bank actions reduce interest rate volatility?, *Economic Modelling*, **65**(2000), 129–137.

# Towards new measures of risk for the EU stock market

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## Extended abstract <sup>1</sup>

Several studies highlight the importance of using option-implied measures in asset pricing and portfolio management [1]. Option prices reflect the risk of rare economic events, such as consumption disasters [2], and become very useful in highly uncertain situations such as build-ups of potential systemic risk [3], since they represent natural financial instruments for hedging purposes. Nowadays, the only option-implied index based on various EU markets is the VSTOXX index. The VSTOXX, officially Euro Stoxx 50 Volatility Index, is referred to as the “European VIX” since it represents the equivalent of the VIX index for the European markets, and it is the most widely used measure of expected volatility in Europe. Although VSTOXX is considered the leading market indicator on risk sentiment in the Eurozone, it has received some criticism in the literature [4]. There is mixed evidence about its importance in stock pricing exercises in the EU market, raising doubts

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about the ability of the VSTOXX to reflect the investor sentiment and the overall EU economic uncertainty for all European markets. We investigated the properties and the information content of the VSTOXX volatility index for the EU markets by using different techniques, including OWA [5]. We also proposed a new index that can capture risks beyond the level of implied volatility measured by the VSTOXX. We find important implications for investors, financial intermediaries, and regulators. First, the VSTOXX index can correctly measure the volatility risk only for France and Germany, while the results depend on the period under investigation for the other countries. Second, the VSTOXX acted more as an OR-like measure than an AND-like measure of volatility for the EU stock markets and represented an average for the EU volatility only during high volatility periods. Third, the proposed measure of risk embeds useful information about future market volatility, thus acting as an early warning against future volatility.

### **Keywords**

Volatility indices; EU markets; Asymmetry; OWA aggregation.

### **References**

- [1] E. Elyasiani, L. Gambarelli, S. Muzzioli. Moment risk premia and the cross-section of stock returns in the European stock market. *Journal of Banking & Finance* **111**(2020), 105732.
- [2] S.B. Seo, J.A. Wachter. Option Prices in a Model with Stochastic Disaster Risk. *Management Science* **65**(2019), 3449–3469.
- [3] M. Bevilacqua, R. Tunaru, D. Vioto. Options-Based Systemic Risk, Financial Distress, and Macroeconomic Downturns (2020). Available at: <http://dx.doi.org/10.2139/ssrn.3748621>.
- [4] S. Peterburgsky. Aggregate volatility risk: International evidence. *Global Finance Journal* **47**(2021), 100494.
- [5] R.R. Yager. On ordered weighted averaging aggregation operators in multicriteria decisionmaking. *IEEE Transactions on Systems, Man, and Cybernetics* **18**(1988), 183–190.