# NEW METHODOLOGIES FOR SYSTEMIC RISK MEASUREMENT

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The financial crisis has illustrated the importance of timely and effective measures of systemic risk. The ECB and other policy-making institutions are currently devoting much time and effort to the development of tools and models which can be used to monitor, identify and assess potential threats to the stability of the financial system. In this article, we present three such models recently developed in DG-Research. The first model uses a framework of multivariate regression quantiles to assess the contribution of individual financial institutions to systemic risk. The second model aims to infer the unobserved drivers of systemic risk from observed data, combining them to form coincident and early warning indicators. The third model assesses whether the housing market in a given country is overheating, by comparing price developments with fundamentals.

An understanding of systemic risk is central to macro-prudential supervisory and regulatory policies. Quantitative measures of systemic risk can be helpful in the identification and assessment of threats to financial stability. This article reviews three models which can be used for such purposes.

The first section describes an econometric framework used to estimate the contribution of individual financial institutions to overall system risk. Since the failure of systemically important financial institutions can inflict severe negative externalities on the whole financial system, as well as the real economy at large, supervisory bodies must be able to identify such potential sources of instability if they are to take appropriate policy action.

The second section discusses how macro-financial and credit risk data can be filtered in order to construct indicators of systemic risk. "Credit risk bubbles" are detected in episodes during which credit risk conditions decouple significantly from underlying macro-financial fundamentals. This approach can be usefully applied as an early warning signal for macro-prudential purposes.

The third section presents a model with which to assess vulnerabilities in the housing market. Housing bubbles represent a major source of systemic risk, as although they build up only gradually over time, they typically burst suddenly, to the detriment of the economy as a whole. The model examined in this article makes use of data on house prices and macro-economic fundamentals to derive the probabilities of overheating in various European housing markets.

## VAR for VaR: measuring systemic risk using multivariate regression quantiles

*Regulating the risk of financial institutions in isolation does not necessarily prevent excessive risk taking in the aggregate.*

In the current debate on systemic risk, great emphasis has been placed on the question of how to measure whether an institution is of systemic importance. In particular, it has been argued that since the failure of a systemically important financial institution could produce severe negative externalities with a bearing on the whole financial sector, the supervision of financial institutions should, among other things, take into account the spillover of risks within the financial system. The regulatory constraints imposed on firms should therefore reflect their overall systemic importance.

The events of the past three years have highlighted how regulating the risk of financial institutions in isolation does not necessarily prevent excessive risk taking in the aggregate. From a macro-prudential perspective, the focus should be on the contribution each institution makes to overall system risk. A popular means by which to assess the systemic importance of a financial institution is to look at the sensitivity of its Value at Risk (VaR) to shocks to the whole financial system.[1]

White, Kim and Manganelli (2010) propose a novel method by which to estimate such sensitivity. The methodology is based on a vector autoregressive (VAR) model, in which the dependent variables are the VaR of individual financial institutions and of the overall market, which depend on (lagged) VaR and past shocks. The authors demonstrate the

1 *See, for instance, Adrian and Brunnermeier (2009), Acharya et al. (2009), and Engle and Brownlees (2010).*