This project addresses the identification problem in models with forward-looking expectations (DFLE), of which the most popular representative is a class of dynamic stochastic general equilibrium models. DFLE models constitute the workhorse framework of modern macroeconomics, and their deep parameters are often estimated using macroeconomic time series.

In the literature, the local identification problem for DFLE models has been largely resolved, although some challenges remain with the implementation of the existing approaches. In contrast, the common feature of all works on global identification is the reliance on some numerical algorithm to search over all observationally equivalent structural parameters. If the model is only locally non-identified, this should work well. However, if the model is locally but not globally identified, we cannot rule out the situation that we failed to find some observationally equivalent points (even if such points exist), and falsely conclude that the model is globally identified. Thus, the fact that no analytical results have been offered to date is a serious methodological gap.

The objective of this project is to fill this gap and propose an analytical framework which, when combined with the recent developments in the field of symbolic (i.e. analytical) computation, will be able to effectively prove whether a given DFLE model is globally identified at a given point in the parameter space or not and, in the latter case, help understand the source of identification failure.

We expect to contribute to the literature in several important ways. We first plan to generalize and unify some theoretical results that underly our analysis. The next major contribution will be related to a practical implementation of our theoretical framework. In particular, we will attack the problem from the perspective of the modern algebraic geometry. To our best knowledge, this will be the first application of this area of mathematics in identification analysis in economics at all, and one of a few in the broad economics literature. Since those methods operate on exact arithmetics (not numerical approximations), they will allow to judge in a constructive way whether a given DFLE model is identified or not. This is not possible using any other method from the literature.

While designed to deal with global identification, our framework will also offer some additional insights to the local identification problem. In contrast to the existing and well-established approaches, in the latter case, our identification analysis will explicitly indicate whether there is possibility to achieve identification by fixing some particular parameters. This formal information concerning identifiability is not available using any alternative frameworks.

When applied to important macroeconomic models existing in the literature, our framework may either strengthen the confidence in their economic implications (if global identification is confirmed), or force the economists to rethink them or at least treat with caution (if global identification failure is detected). Needless to say, such findings have the potential to exert significant influence on the design of macroeconomic models in the future.