

# Clue to Resolve Forward Guidance Puzzle

## - Literature Review -

Kento Yoshizawa

April 29, 2020

The research question which this study focuses on is the following: How can the heterogeneous agent New Keynesian (HANK) model resolve the forward guidance puzzle? As reviewing the existing literature related to my research question, I describe the studies of (i) forward guidance puzzle and suggested approach to resolve it and, (ii) HANK and that as the means of resolving the forward guidance puzzle. Then, I briefly summarize my contribution to this literature and other references for the technical aspects of my research.

### Forward Guidance Puzzle

Forward guidance is an innovative policy tool and it is defined that central banks announce the future path of monetary policy to the public. A dynamic macroeconomics theory strongly justifies the use of this tool which could be effective especially under the zero lower bound and the liquidity trap. However, [Del Negro et al. \(2015\)](#) points out that evidence on the quantitative effects of this policy tool on the macroeconomy is still limited, which is called the "forward guidance puzzle". In [Del Negro et al. \(2015\)](#), the empirical evidence shows the effect of the forward guidance on output and inflation expectations are positive but their medium-scale DSGE model (the FRBNY DSGE) implies an unrealistically large response to the forward guidance compared to the empirical results. In the paper, they argue that incorporating the perpetual youth model (overlapping generations model) to the New Keynesian model can be a solution to the forward guidance puzzle.

[Gertler \(2017\)](#) provides insight into the power of forward guidance using the example of Japan's large quantitative easing policy. He explains the disconnect between the Japanese

experience and the theory from the perspective of the forward guidance puzzle and suggests relaxing the part of the rational expectations assumptions to mute the power of forward guidance. The heart of forward guidance puzzle in standard New Keynesian model (representative agent New Keynesian model, or RANK) is the substantial role for intertemporal substitution, which is derived from the consumption Euler equation.

Although HANK is one of possible and plausible approaches to step outside the assumptions of rational expectations, a behavioral approach is another way to resolve the puzzle. [Gabaix \(2016\)](#) introduces a new "cognitive discounting" parameter to the standard New Keynesian model to analyze how bounded rationality affects policy. The cognitive discounting parameter allows agents to be myopia rather than rationally expect for the future. Thus, he concludes the power of forward guidance is muted due to agents' myopic behavior.

[Kiley \(2016\)](#) focuses on the aspect of forward guidance puzzle in the New Keynesian Phillips Curve. The paper argues that sticky information (adaptive view of inflation) could reduce the power of forward guidance in a sticky-price assumption which is commonly accepted in the New Keynesian model because the sticky information Phillips curve is less forward-looking. In other words, this is one way to relax the rational expectations assumptions in the form of the Phillips Curve.

## Heterogeneous Agent New Keynesian model

In the recent dynamic macroeconomics literature, heterogeneous agent New Keynesian (HANK) models have attracted research attention. [Oh and Reis \(2012\)](#) firstly incorporate idiosyncratic income risk or imperfect credit market and nominal rigidities in the New Keynesian model. Although the paper focuses on the effect of lump-sum transfer from the government, it provides the model in which there is no representative agent.

As the application of HANK for monetary policy, [Kaplan et al. \(2018\)](#) analyzes the transmission mechanism from monetary policy to household consumption with the HANK model, which yields a realistic distribution of wealth and marginal propensities to consume due to idiosyncratic income shocks and borrowing constraint. This assumption could attenuate intertemporal substitution that RANK relies on the main driver of the transmission from interest rates to consumption. Instead, the HANK model reveals that the indirect effect of

monetary policy shocks is substantial.

McKay et al. (2016) contributes to the development of the HANK model as the means to understand and solve the forward guidance puzzle. Like Kaplan et al. (2018), they argue that people are likely to face some risk of hitting a borrowing constraint or idiosyncratic income risk. These risks are supposed to shorten households' planning horizon and increase precautionary savings, which both could reduce households' ability to smooth consumption. As a result, the HANK model predicts the power of forward guidance is weakened compared to the prediction from the RANK model. In the paper, they illustrate the power of forward guidance in the RANK model and show that the effect is cumulatively large as the guidance gets further out in the future. Then, they estimate the impulse responses to the output and inflation from the monetary policy shock caused by forward guidance in both the RANK and HANK model with calibrated parameters. The result indicates that the HANK model can mute the power of forward guidance.

Farhi and Werning (2019) compares the HANK model involving bounded rationality (level-k thinking), which means they combine incomplete markets, idiosyncratic risk, borrowing constraint and bounded rationality, to the RANK model. They estimate the model with calibrated parameters and find that the interaction of these frictions leads to the mitigation of the power of monetary policy.

From the point of the central bank's view, Acharya and Dogra (2018) provides analytical tractability for a good understanding of the difference between the HANK and RANK model. They emphasize on the importance of the cyclicity of income risk to resolve forward guidance puzzle while other HANK literature tends to stress the role of marginal propensity to consume heterogeneity and precautionary savings.

The existing literature has shown so far that the HANK model is a good candidate to resolve the forward guidance puzzle. However, some studies point out that the effect of forward guidance in HANK model is as powerful as in RANK model under certain conditions. For example, Werning (2015) shows that a model with extreme market incompleteness case (i.e., no borrowing and no public debt) predicts the same magnitude of forward guidance as to the RANK model.

Those works which I've reviewed so far mainly focus on the theoretical aspect and just

simulate the model to measure the magnitude with using calibrated parameters. Thus, the contribution of my research is that empirically estimate both HANK and RANK models from data and measure the magnitude of the forward guidance with estimators. This approach can provide the empirical evaluation of the validity of the HANK model and also hands-on analytical tools to see the fitness of the HANK model.

Finally, regarding the technical aspect of my research, [Ahn et al. \(2017\)](#) provides an efficient and easy-to-use computational method for estimating the HANK model. They show the application as a simple extension of standard linearization techniques but still consistent with the HANK model. Thus, my research makes use of their suggested method to build estimation procedures.

## References

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