In this chapter, I provide the background and motivation to the book by introducing some basic principles about monetary policy and term structure modeling.

I begin in section 2.1 with an overview of the conventional operation of monetary policy prior to the Global Financial Crisis (GFC). I then provide an initial indication of the complications introduced by the ZLB for nominal interest rates.

In section 2.2, I introduce a class of standard term structure models that has proven very popular for many applications. However, I also show that models of that class are no longer appropriate to use in a ZLB environment.

As a resolution to the deficiencies of those standard term structure models, I introduce the class of shadow/ZLB term structure models in section 2.3, which will be the predominant focus of the remaining chapters. In section 2.4, I briefly return to the topic of monetary policy to show how the output from shadow/ZLB term structure models, such as the “Shadow Short Rate” or particularly the “Effective Monetary Stimulus,” can be used to monitor and quantify the stance of monetary policy in ZLB environments.

The final section, 2.5, briefly discusses alternative ZLB models. This section is not necessary for those specifically interested in shadow/ZLB-GATSMs and their application, but it is useful to explain why alternative ZLB models do not necessarily provide a satisfactory solution to modeling the term structure in ZLB environments.

2.1 Monetary policy

2.1.1 Pre-GFC

Operating and monitoring monetary policy with a policy interest rate used to be relatively simple before the GFC, in principle at least. In non-ZLB environments, policymakers in central banks would first gauge the state of the real economy and inflation relative to their objectives. They would then freely set the policy rate above or below their judgment of a neutral interest rate, which I will discuss further below, to efficiently achieve the macroeconomic objectives over an appropriate horizon.
For example, consider a central bank facing inflation below its target rate due to economic output (the level of gross domestic product, or GDP) being below potential output (the noninflationary level of output). The central bank would seek to bring inflation back to target by lowering the policy interest rate and perhaps offering indications of likely future settings. Participants in financial markets would observe the current policy rate and indications of future settings, and would appropriately incorporate those into wider financial markets, such as equity prices, currency rates, and the many different categories of interest rates in the economy (e.g., government bond markets, interbank interest rates, household and business lending rates, etc.). In this particular example, the resultant higher equity prices, lower exchange rate, and lower interest rates would help stimulate economic activity, thereby leading to faster output growth. Hence the level of output would rise relative to potential output, which would in turn help bring inflation back to target. That relationship is typically summarized by a Phillip’s curve, which relates inflation to the output gap (i.e., output as measured by real GDP relative to potential output).

Of course, as is typically the case in economics and finance, the in-principle simplicity above is subject to many practical caveats and complexities in practice. Even the causation I have implied is readily subject to more nuanced interpretations. For example, equity prices should rise partly due to the expectations of faster output growth anticipated in response to the lower policy rate. For the purposes of this introduction, I simply give several broad examples of the practical issues and note that numerous journal articles and entire textbooks are filled with material on aspects relating to each of the individual items and their subcategories.¹

- **Central bank objectives may vary over time.** Even if the single objective is an inflation target, that target or the horizon for achieving it can change. More generally, central banks may have explicit or implicit multiple objectives/responsibilities (e.g., employment, macroeconomic stabilization, macro-prudential oversight, etc.), and so the policy rate setting may emphasize different objectives at different points in time.

- **The current states of the real economy and inflation are uncertain.** First, macroeconomic data are published after the period to which they relate and are often revised, so the current values of the relevant data must be estimated by the central bank.² Second, concepts such as output relative to potential output (or unemployment-based proxies) are quantities that are unobservable. Hence, they must also be estimated, which also needs to allow for time variation (because potential output growth varies with changes to labor productivity, population, capital investment, etc.).

- **The appropriate policy rate setting given the (changeable) objectives and the (uncertain) macroeconomic environment is somewhat subjective.** First, the neutral interest rate is a conceptual and unobservable quantity that is essentially a policy setting that would keep output at its potential and inflation at its target.