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### Real and nominal effects of central bank monetary policy <sup>☆</sup>

Michael Kahn<sup>a</sup>, Shmuel Kandel<sup>b,c,d</sup>, Oded Sarig<sup>c,e,\*</sup>

<sup>a</sup> Bank of Israel, Jerusalem 91007, Israel <sup>b</sup>Tel Aviv University, Tel Aviv 69978, Israel <sup>c</sup> Wharton School of the University of Pennsylvania, Philadelphia, PA 19104, USA d CEPR, Switzerland <sup>e</sup> Arison School of Business, IDC, Herzliya 46150, Israel

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#### Abstract

We examine the impact of monetary policy using Israeli data on *nominal* and *indexed* bonds, which allow us to decompose nominal interest rates into inflation expectations and ex ante real interest rates. We find that a monetary policy shock, introduced by raising the overnight rate the Bank of Israel charges member banks, raises real interest rates but lowers inflation expectations. Long-term real interest rates are less impacted than short-term rates. Lastly, monetary shocks affect the exchange rate between the Israeli currency and the US dollar. Our estimates are robust to numerous modifications to the basic VAR model.

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E-mail address: sarig@idc.ac.il (O. Sarig).

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<sup>\*</sup>Corresponding author. Arison School of Business, IDC, P.O. Box 167, Herzliya 46150, Israel. Tel.: +972-9-952-7375; fax: +972-9-956-7392.

#### 1. Introduction

In this paper we examine real and nominal effects of monetary policy using market data—inflation expectations and *real* interest rates extracted from observed prices of indexed and nominal government bonds. Some of the questions that we try to answer are: Does the central bank monetary policy affect *real* interest rates? Does monetary policy affect inflation *expectations*? If the central bank monetary policy affects real interest rates or inflation expectations, is there a lag in the policy's impact on these variables? What is the magnitude of the policy's impact and how long does it last? Does the central bank monetary policy lead or respond to changes in the price level?

Theory provides mixed answers to these questions. On one extreme, super neutrality implies that monetary policy does not impact real activity, which implies that, inter alia, it does not impact real interest rates. On the other hand, Keynsian analysis allows for real effects of monetary policy via its effect on real interest rates. Thus, the importance of empirical answers to these questions, both for academic research and for policy making, is self-evident. Indeed, a large body of empirical research has been devoted to estimating the real effects of monetary policy.

Numerous recent studies estimate the response of macro-economic variables to monetary policy shocks using vector autoregression (VAR) models and data of many countries and across varied monetary regimes (see, for example, Edelberg and Marshall, 1996; Christiano and Eichenbaum, 1992; Christiano et al., 1996; Sims, 1992). These and other studies have yielded several empirical regularities, which are often termed "puzzles." For example, the "liquidity puzzle" is the finding that an increase in monetary aggregates is accompanied by an increase (rather than a decrease) in nominal interest rates. Another example, often referred to as the "exchange rate puzzle," is the finding that an increase in non-US nominal interest rates is accompanied by a depreciation (rather than an appreciation) of the local currency.<sup>2</sup> While the term "puzzle" has been repeatedly used in reference to these findings, a simple explanation, consistent with economic theory, exists for these empirical findings. Specifically, these "puzzles" (as well as other "puzzles" discussed in Grilli and Roubini, 1996) may merely reflect the lack of a direct measure of inflation expectations. This is because, unless inflation expectations (or a proxy for these expectations) are observable, one cannot infer from an observed increase in nominal interest rates that a commensurate increase in real interest rates occurred. Consequently, it is difficult in studies that examine *nominal* interest rates to distinguish between the interaction of central bank policy with real interest rates and its interaction with *inflation expectations*. Similarly, because these studies typically analyze realized inflation rates rather than inflation expectations, they cannot examine the extent to which monetary policy leads or reacts to changes in inflation and inflation expectations.

<sup>&</sup>lt;sup>1</sup>See, for example, Leeper and Gordon (1992) and Reichenstein (1987).

<sup>&</sup>lt;sup>2</sup> See, for example, Sims (1992) and Kim and Roubini (1995).

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