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Do precious metal prices help in forecasting South African inflation?

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ABSTRACT

In this paper we test whether the key metals prices of gold and platinum significantly improve inflation forecasts for the South African economy. We also test whether controlling for conditional correlations in a dynamic setup, using bivariate Bayesian-Dynamic Conditional Correlation (B-DCC) models, improves inflation forecasts. To achieve this we compare out-of-sample forecast estimates of the B-DCC model to Random Walk, Autoregressive and Bayesian VAR models. We find that for both the BVAR and BDCC models, improving point forecasts of the Autoregressive model of inflation remains an elusive exercise. This, we argue, is of less importance relative to the more informative density forecasts. For this we find improved forecasts of inflation for the B-DCC models at all forecasting horizons tested. We thus conclude that including metals price series as inputs to inflation models leads to improved density forecasts, while controlling for the dynamic relationship between the included price series and inflation similarly leads to significantly improved density forecasts.

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1. Introduction

The value of the local currency in South Africa (SA hereafter) is often linked to a large extent to commodity prices, in particular that of precious metals (which make up nearly a fifth of total exports). As such, markets tend to view precious metal price movements as significant factors explaining domestic currency movements. Currency fluctuations, in turn, impact overall prices in the economy, the extent of which is generally unclear in SA. The purpose of our paper is then to assess whether metals prices should in fact be considered as important inputs in forecasting local inflation.

We consider in this analysis the prices of gold and platinum, which make up the largest part of our precious metals export basket. We set out to test whether the inclusion of these key metal price series improves our ability to forecast inflation for SA. We also test whether explicitly controlling for the time-varying nature of co-movement between these series significantly improves point and density forecasts.

Similar to the work of [Chen, Turnovsky, and Zivot \(2011\)](#), our analysis excludes other fundamental factors which are based on alternative structural models of price dynamics, such as including the output gap or measures of financial

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development or trade openness.¹ The main objective of this paper is to determine whether gold and platinum prices, which can be considered largely exogenous in terms of local price discovery, are useful in complementing forecasting models of inflation. This will be tested by using out-of-sample point and density forecasts of SA inflation for the period since adopting inflation targeting in 2000. To achieve this, we first fit Bayesian Vector Autoregression (B-VAR) and Bayesian VAR Dynamic Conditional Correlation (B-DCC) models, which we then use to produce out-of-sample forecasts at different horizons. We then compare to the naive Random Walk and Autoregressive model, in terms of the forecasts of inflation, in order to assess whether any meaningful forecasting information has been added by the metals series. This follows as the latter benchmark models are solely based on past information of inflation.

Both the B-VAR and B-DCC models are estimated using Bayesian Markov Chain Monte Carlo (MCMC) methods. Forecasts are generated using recursive estimations, while expanding the estimation sample as forecasting moves forward. The Bayesian procedures make use of Normal diffuse priors and posteriors, and the models are estimated using Gibbs sampling.

Our results provide insight into the usefulness of employing Bayesian shrinkage methods to VARs and utilizing time-varying correlation estimates in forecasting inflation using real price inputs, in addition to assessing the importance of precious metals prices in forecasting inflation. The results can then be summarized in two key findings. Firstly, that gold and platinum prices generally provide useful information as input to inflation density forecasts for South Africa at multiple horizons since 2000. This is complementary to findings of [Chen et al. \(2011\)](#), who also illustrate the importance of considering metals price series as inputs to SA and other inflation targeting emerging market inflation forecasts. Secondly, we find that utilizing time-varying correlation estimates also improves density forecasts of inflation for variables included in the estimation. A future study might consider utilizing similar strategies to test other structural inputs in forecasting inflation.

The paper is organized as follows: Section 2 discusses the literature relevant to our study and contextualizes our approach. Thereafter, Section 3 discusses the methodology that we will use in order to address the questions posed in the introduction, using the data discussed in 4. Section 5 discusses the results, after which we conclude the paper in Section 6.

2. Literature review

Most economists and monetary authorities would agree that commodity prices have significant inflationary consequences, although, as suggested by [Gospodinov and Ng \(2013\)](#), opinions on the formal link between inflation and commodity prices remain divided. Some argue that asset market- and commodity prices should be considered leading indicators to the general price level, while others argue that idiosyncratic movements impact prices mainly through the distribution channel. Despite inconclusive evidence of the direct link between commodity prices and inflation², suggestions as to how authorities should respond to commodity price signals remain divided. [Bean \(2004\)](#) provides a more detailed comparison of views on how to approach a build-up of general asset market prices in an inflationary targeting regime. [Fuhrer and Moore \(1992\)](#) and [Bernanke and Gertler \(2000\)](#), e.g., suggest that authorities should not respond to asset market prices as it could lead to a loss in inflationary control.³ Others, such as [Cecchetti, Genberg, and Wadhvani \(2002\)](#), have suggested that policy initiatives aimed at targeting asset price misalignments could improve general price stability and the overall macroeconomic performance.

Despite divergent views on the appropriate actions to be taken by inflation targeting authorities, evidence has been provided as to the importance of certain price indexes in improving general price level forecasts. [Gospodinov and Ng \(2013\)](#) provide evidence that a reduced rank of multiple commodity price indexes, using a principal components approach, produces significant improvements in the predictive power of inflation forecasts. [Chen et al. \(2011\)](#) consider four commodity exporting emerging markets which have adopted inflation targeting, including SA, and show that considering commodity price aggregates provide predictive power to inflation forecasts. In particular, they highlight the importance of considering metals price series for SA inflationary forecasts.

We build on the work done by [Chen et al. \(2011\)](#), and focus on SA inflation forecasts using two key metals series: gold and platinum. Precious metals typically make up about 6% of SA exports⁴, and as such price fluctuations could be regarded as having a significant impact on currency valuation. This, in turn, might significantly impact the price setting mechanisms in the economy, which we test formally in this paper. We thus test whether two key precious metal prices add to the forecasting power of general price levels in the domestic economy.

Our approach to answering this question differs from [Chen et al. \(2011\)](#) in that we control for the dynamic nature of the co-movements between the price series in our sample. We follow the methodology developed by [Della Corte, Sarno, and Tsiakas \(2010\)](#) in using Bayesian techniques for the estimation of parameters in our DCC model, which is used to estimate time-varying co-dependence structures. Our methodological construct follows that of [Lombardi and Ravazzolo \(2013\)](#), who study the ability of commodity prices in forecasting equity market prices. The authors use bivariate Bayesian VAR and bivariate Bayesian DCC models to estimate 1, 2, ..., 24 step ahead point and density forecasts for their studied returns series. They then compare these fits to forecasts from a Random Walk model and Autoregressive model fits. The point and density forecast estimates are then compared using statistical test procedures discussed in Section 3. The authors' findings suggest that

¹ C.f. [Ustyugova and Gelos \(2012\)](#) for a structural analysis on the impact of commodity prices on inflation.

² C.f. [Hooker \(2002\)](#) and [Stock and Watson \(2001\)](#) who suggest that evidence of commodity prices improving inflation forecasts are both elusive and episodic.

³ [Bernanke and Gertler \(2001\)](#) suggests, however, that authorities could respond if such price changes reflect changes in forward inflationary expectations.

⁴ According to the Preliminary Statement of Trade Statistics, 2014.

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