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## Nowcasting with payments system data

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## ABSTRACT

We consider the potential usefulness of a large set of electronic payments data, comprising the values and numbers of both debit card transactions and cheques that clear through the banking system, for the problem of reducing the current-period forecast ('nowcast') loss for (the growth rates of) GDP and retail sales. The payments system variables capture a broad range of spending activity and are available on a very timely basis, making them suitable current indicators. We generate nowcasts of GDP and retail sales growth for a given month on seven different dates, over a period of two and a half months preceding the first official releases, which is the period over which nowcasts would be of interest. We find statistically significant evidence that payments system data can reduce the nowcast error for both GDP and retail sales growth. Both debit transaction and cheque clearance data are of value in reducing nowcast losses for GDP growth, although the latter are of little or no value when debit data are also included. For retail sales, cheque data appear to produce no further nowcast loss reductions, regardless of whether or not debit transactions are included in the nowcasting model.

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## 1. Introduction

Observations of the current pace of economic activity are crucial to policy-makers and other decision makers, as they can affect, for example, the implementation of counter-cyclical policies or near-term production decisions. However, the most important measure of economic activity, gross domestic product (GDP) growth, is released with a lag (two months in Canada), and is subject to substantial revision. For this reason, policy-makers require reliable current-period estimates ('nowcasts') of GDP growth and other variables in order to monitor economic conditions.

The main contribution of the present study to this problem is its investigation of a broadening of the

information set that is at the disposal of nowcasters. We compile, and examine the marginal utility of, a database of the transactions that pass through the payments system, which provides us with information on the values and volumes of debit card transactions, as well as of cheques that clear through the banking system. In addition to providing new proxies for household and business spending, these data have the benefit of being compiled electronically as aggregates of all transactions within a given class, and are therefore available quickly, as well as being virtually free of sampling error. In principle, all such electronic payments can be observed by the investigator. However, in practice the numbers are too large; for example, there are more than 12 million debit transactions per day in Canada. Thus, a high degree of aggregation is necessary for use with forecasting or nowcasting models of a monthly or quarterly variable: we are in the position of using 'big data' to learn

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about the relatively 'small data' of monthly economic aggregates.

The additional data that we consider pertain to Canadian debit and chequing transactions. These payments were constructed by aggregating the various payments that clear through the members of the Canadian Payments Association (CPA) on a daily basis. The payments data are organized by transactions between the various CPA members, and also by both type of payment and region; each monthly observation on debit or chequing transactions is computed by aggregating the information from approximately twenty business days per month, twenty member institutions in the payments system, fifteen different types of transaction, two directions of transaction (to or from an institution), and ten payment regions.

The literature on nowcasting has evolved rapidly over the last few years, although it has a long history, beginning with the work of Mitchell and Burns (1938), who classified hundreds of variables as leading, coincident and lagging indicators. This NBER-style study of indicators was updated regularly for the next thirty years, until interest waned around the 1970s. Stock and Watson (1989, 1991) subsequently renewed the interest in coincident indicators via the construction of simple indexes. More recent studies (e.g., Camacho & Perez-Quiros, 2008; Nunes, 2005) have focused on the construction of models primarily for very short-term forecasting, while others (e.g., Andreou, Ghysels, & Kourtellis, 2010) have focused on methodological contributions, with the aim of improving the incorporation of variables measured at different frequencies within a single model. A related strand of the literature aims to construct high-frequency indexes that are capable of capturing turning points in the business cycle in a timely manner (e.g., Aruoba, Diebold, & Scotti, 2009). Bańbura, Giannone, and Reichlin (2010) provide an up-to-date methodological overview, with an emphasis on the mixed frequencies of data and the 'ragged edge' property of data sets, in which components are released at different times.

The method that we use is related to that of Giannone, Reichlin, and Small (2008), in that we track improvements over time for nowcasts of GDP and retail sales growth for a given month. Specifically, we assess the marginal contribution of payments data at seven points in time over a two and a half-month period, extending from one month before the end of the month of interest to six weeks after it, or until two weeks before the data's eventual release. The prima facie evidence suggests that payments data, and especially debit card transactions, can often lower nowcast errors significantly.

The next section describes the payments system data that are being evaluated for their potential contributions to nowcasting, as well as the variables used in our baseline models (that is, models which omit the new payments system data) and the timing of data releases. Section 3 reviews the general challenges that are involved in the forecasting and nowcasting of GDP and retail sales growth, presents the models that are used for evaluating the marginal value of payments data for nowcasting, and measures these marginal contributions. The final section emphasizes some of the limitations of this study, and concludes.

## 2. Data and models

### 2.1. Payments data

Cashless means of payment have become progressively more popular throughout the developed economies. In the U.S., for example (Federal Reserve System, 2014a,b), debit cards are the fastest-growing non-cash means of payment, as cheque use has declined with a corresponding rapidity. The number (value) of debit card transactions per year grew by about 13.0% (12.5%) compounded annually over the period 2003–2012, vs. 5.1% (5.1%) compounded annually for credit cards. While cash transactions are not observed directly, ATM withdrawals fell slightly over the same period, although their average value did increase. The number of cheques written per year fell by approximately 6.2% compounded annually.<sup>1</sup> In Canada, the volume of cheque transactions for retail purchases has traditionally been low, but the pattern of a decline in the volume of cash transactions and an increase in the volumes of debit and credit card transactions is also observable.<sup>2</sup> Arango, Huynh, and Sabetti (2011) note that debit and credit cards accounted for about 89% of the value of retail transactions above \$50 in Canada in 2009, while cash was used for the remaining 11%.<sup>3</sup> Debit card transactions in Canada are governed by the Interac Association, whose members are largely financial institutions, and clear through the Canadian Payments Association. In 2012, there were approximately 165 debit transactions per person in the U.S., and 126 per person in Canada (according to the Bank for International Settlements). The total value of all debit transactions in Canada reached \$ 211 billion in 2014.

It is clear that both the number and proportion of consumer transactions that give rise to an observable electronic record are increasing. Such data have the potential to help us learn about consumer behaviour by examining these purchases both individually and at various levels of aggregation. One class of application, which generally relies on scanner data, has involved studying pricing decisions in an industrial organization context (see e.g., Campbell & Eden, 2014; Shankar & Bolton, 2004). Others have used scanner data to obtain an understanding of price movements or the effects of price movements on other purchases (e.g., Burstein, Eichenbaum, & Rebelo, 2005; Gicheva, Hastings, & Villas-Boas, 2010; Silver & Heravi, 2001). Another potential application is in studying the impacts of external events on consumer purchasing, as per Galbraith and Tkacz (2013), for example, who study consumer expenditures using the daily aggregate of all debit card expenditures at the times of three extreme events, and on the days following.

For the purposes of the present paper, however, we are interested in electronic transactions, because

<sup>1</sup> Federal Reserve System, 2014b, Table 3.4.2, p. 42.

<sup>2</sup> See Arango, Huynh, Fung, and Stuber (2012, p. 32, Chart 1).

<sup>3</sup> Cheques account for fewer than 1% of all transactions, but the average value of small (under \$50,000) cheques that clear through the payments system is over \$1,100, reflecting the fact that they are used for large infrequent transactions, such as rent payments, tuition fees, income and property taxes, and the purchase of expensive items such as automobiles.

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