

Using the payment system data to forecast economic activity

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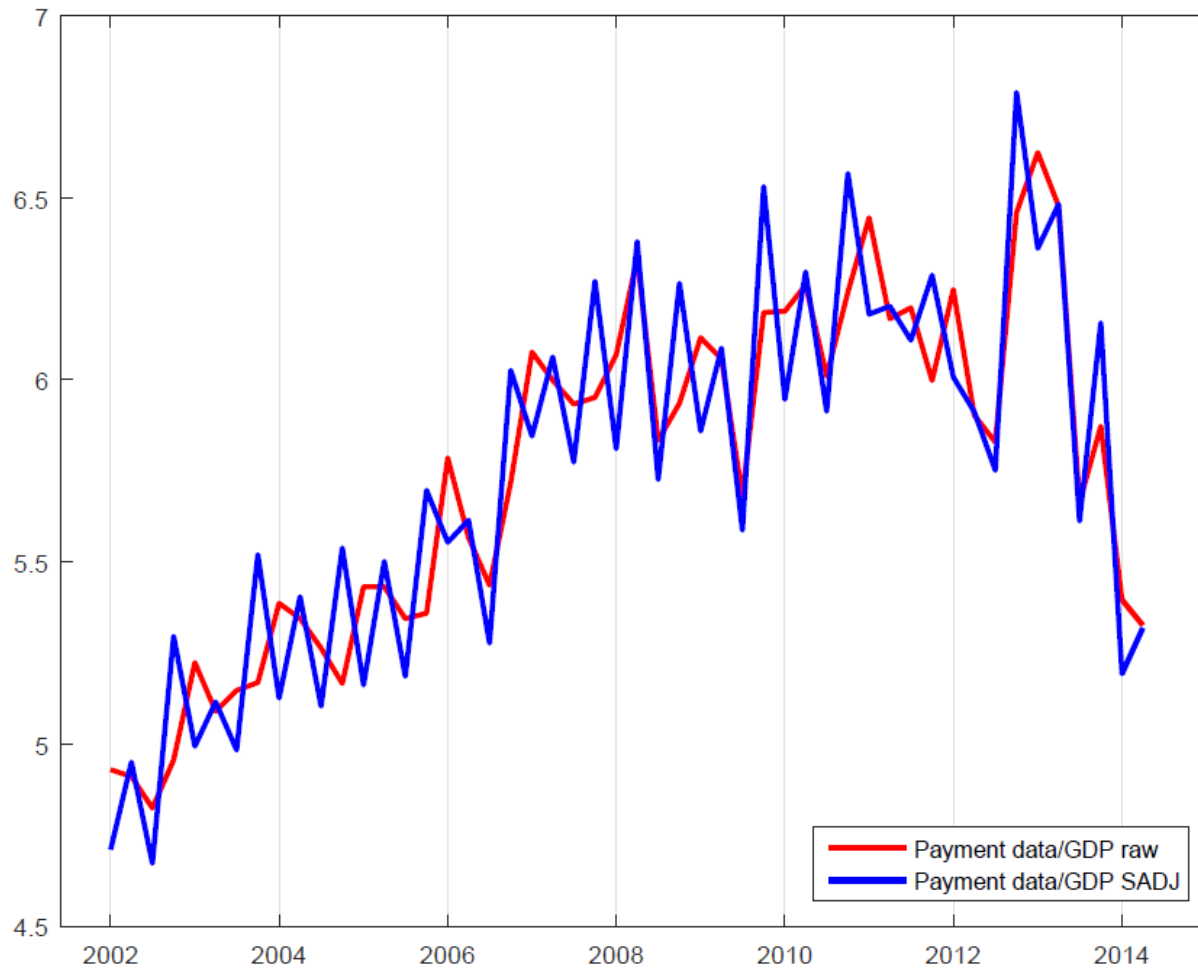
Sapporo, June, 26th 2017

Motivation and Research question (1)

- Search for innovative information to **improve the forecasting ability**, **increasing need** to link financial information with macro forecasts (see financial crisis or digital transformation of the ecosystem).
- Since the seminal work of Fischer **MV=PQ**
- **Payment System Data** show suitable features **to track the short-term evolution of the economic activity** and the **consumer behaviour**
 - Compiled in real-time by as single source → timeless and reliability
 - No backward revisions
 - Size / relevance

Payment flows

Ratio between Payment flows and GDP



Motivation and Research question (2)

This paper:

- Describes the payment system data. A picture for Italy
- Provides empirical evidence on the comovement between payment data and economic activity
- Evaluate the ability of the payment data to forecast GDP q-o-q
 - Selection of targeted predictors LASSO
 - MIDAS dynamic factor model with Kalman smoothing
- Proves the contribution of the payment data to track the short-term evolution of the GDP

Literature

Duarte, Rodrigues and Rua 2017

ATM/POS data for nowcasting and forecasting the quarterly private consumption. MIDAS model.

Galbraith and Tkacz 2017

Values and volumes of debit and credit card as well as cheques to nowcast GDP growth for Canada. Simple OLS model with three regressors (Composite Leading Index, PD, lagged y)

Carlsen and Storgaard 2010

Electronic payments by card to nowcast the retail sales in Denmark

Literature

Esteves 2009

ATM/POS data as an indicator to estimate private consumption (the y-o-y growth of non-durable goods and consumption) in Portugal. Single-indicator models and different combinations (Diebold 1988) assessed

Galbraith and Tkacz 2009

Canadian debit card data as high-frequency indicators to analyze the very short-term impact of quite large and highly transitory economic events (extreme events as the terrorist attacks on 9/11 and electrical blackout on 8/13) on the economy. Only descriptive evidence.

Galbraith and Tkacz 2007

Debit cards payments to monitor the economic activity in real-time (correlation between PD and a) consensus forecast errors, b) revisions on the first official estimate; the short-term impact of extreme events. No inference; only empirical evidence.

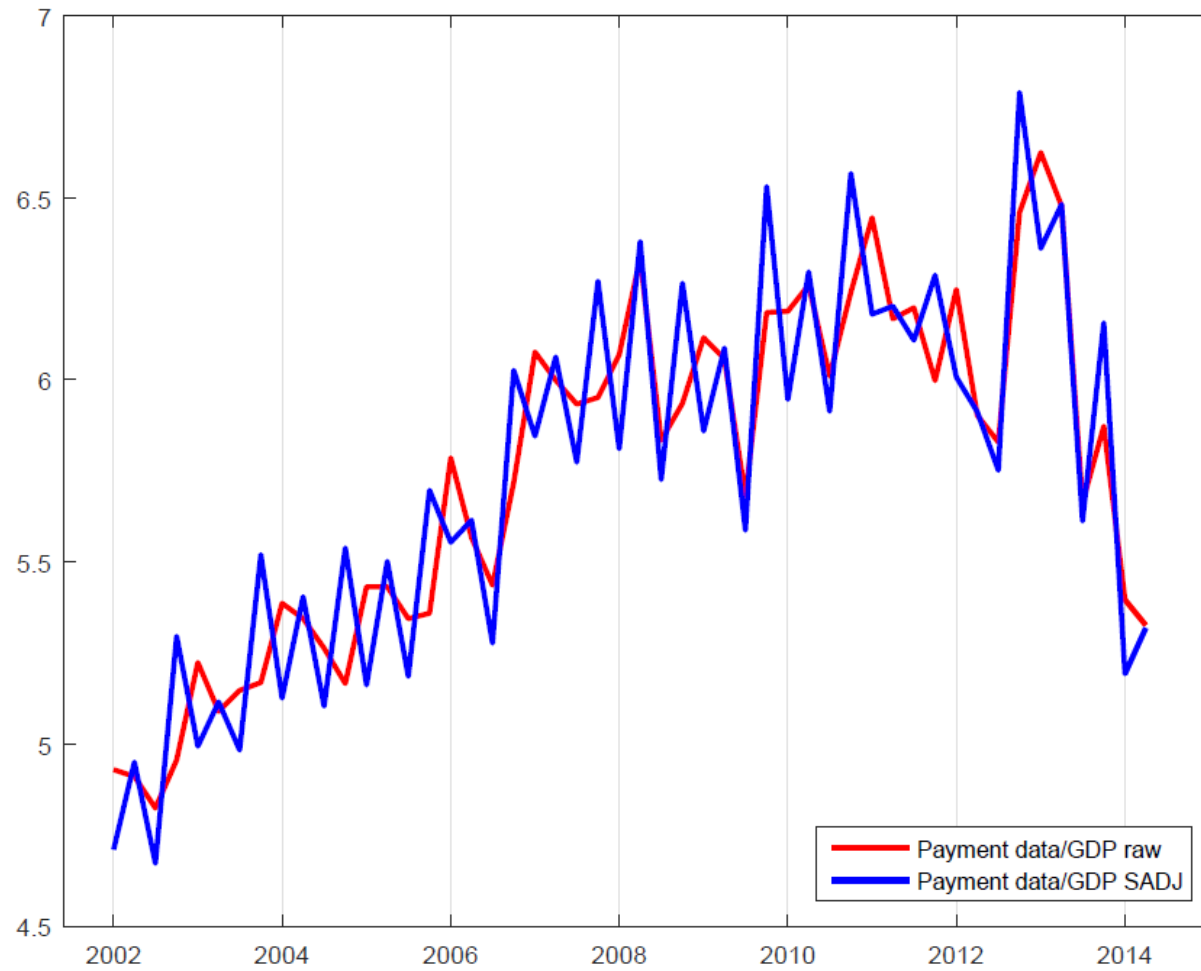
Payment system - historical notes

- Monetary union entailed the harmonisation of the infrastructure to transfer money
- 1999 TARGET
 - Effectiveness of the monetary policy
 - Security of the payments
- 2003 TARGET2 (crucial contribution of the BoI)
- SEPA

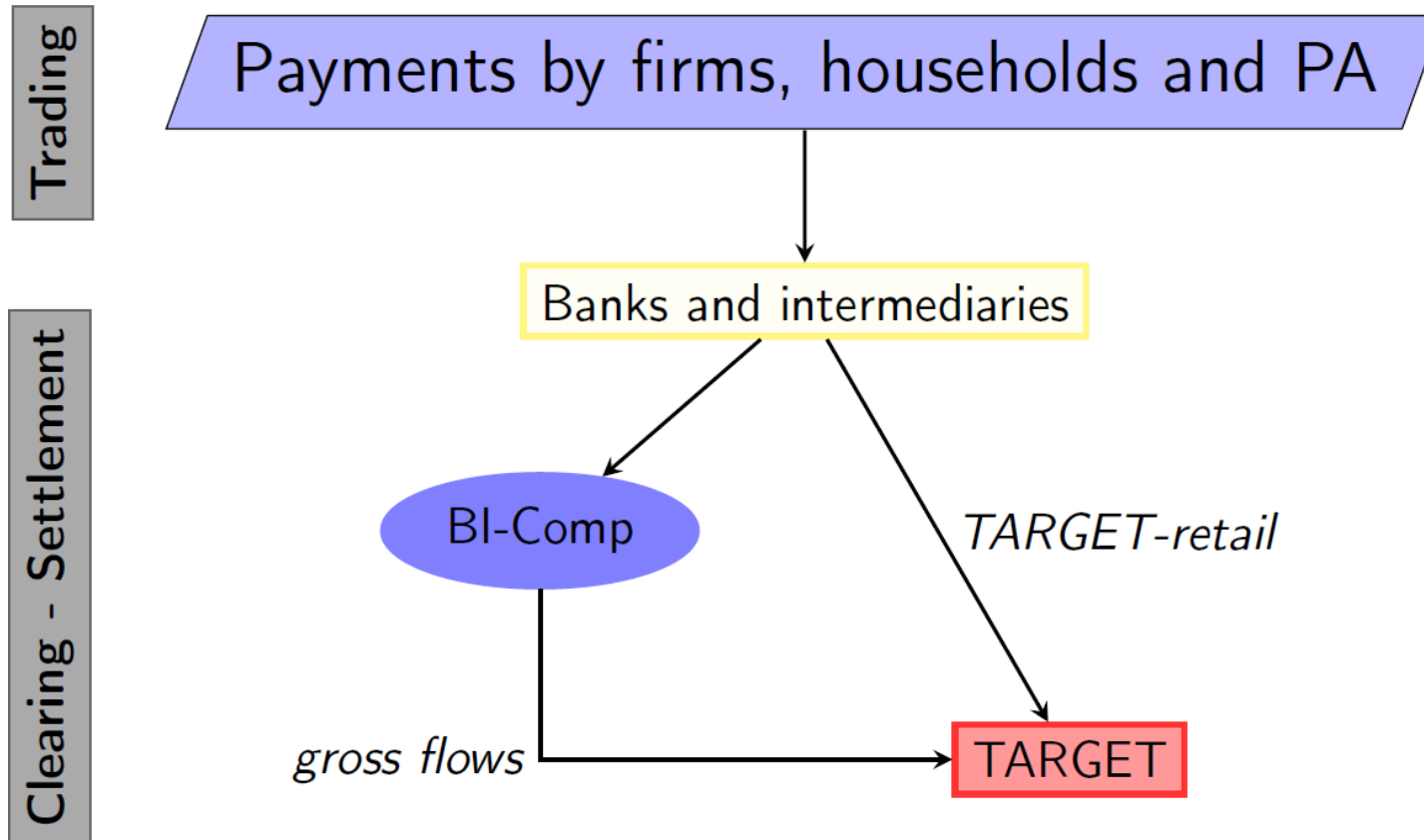
- *Wholesale payments* operated by
 - TARGET2 provided by Bank of Italy
 - EURO1 provided by EBA clearing
- *Retail payments* operated by
 - SEPA ACH since 2014
 - BI-COMP
 - TARGET2-retail

Payment flows

Ratio between Payment flows and GDP



Payment system - description



A picture for Italy

- Cash-payment

Is still highly widespread in terms of volume: 80% of the n. transaction

..but it accounts for 45% of the value of consumer-to-business transactions

...and 10% of all transactions (including business-to-business)

- Retail non-cash payments settled through BI-COMP and T2 amount to 5 trillion euros on yearly basis

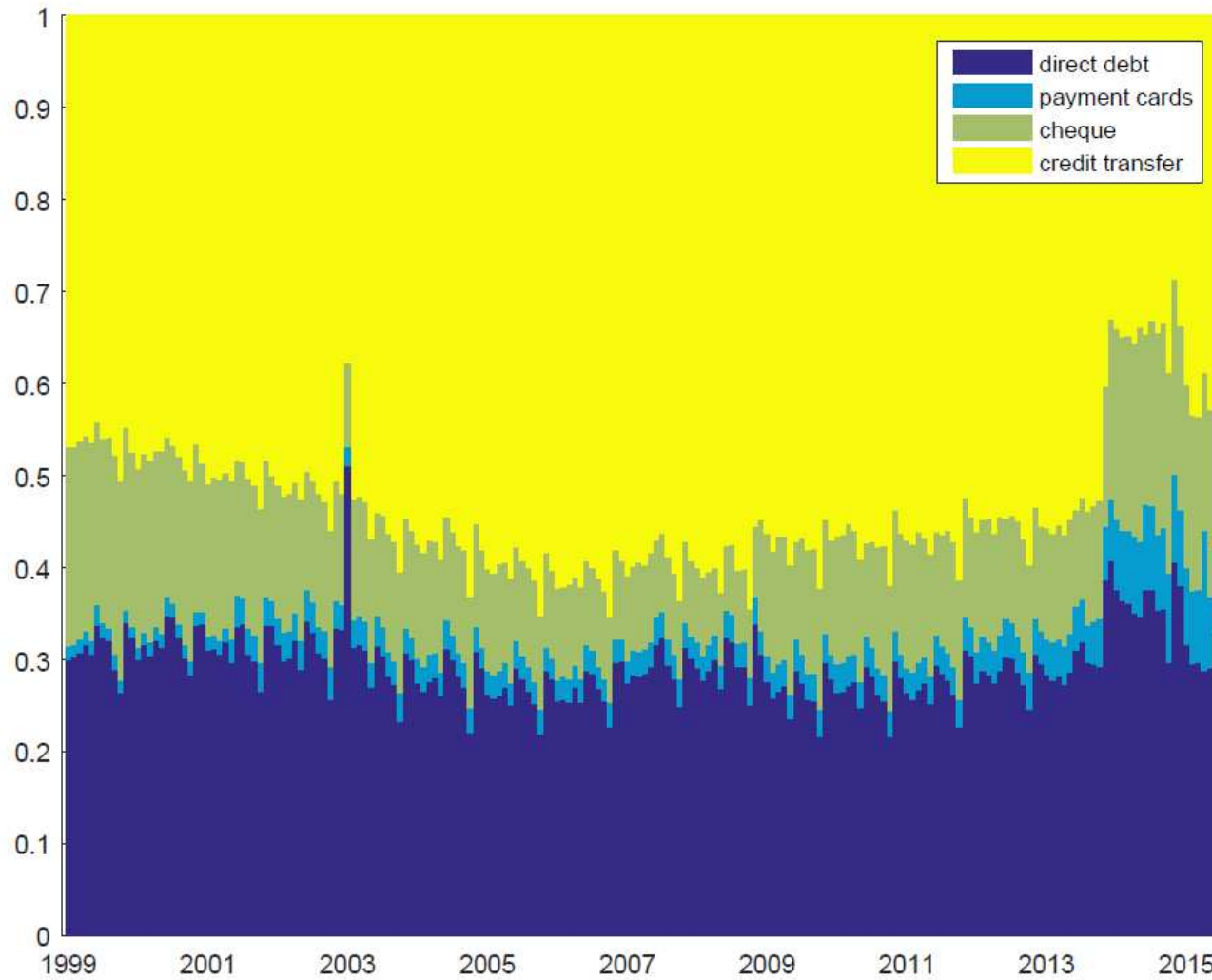
60% of the total value of retail non-cash payments

80% if we consider only the electronic payments

- Credit transfer

Represents the largest share of the tot. non-cash transactions (55%).

Figure: quotas of the payment instruments

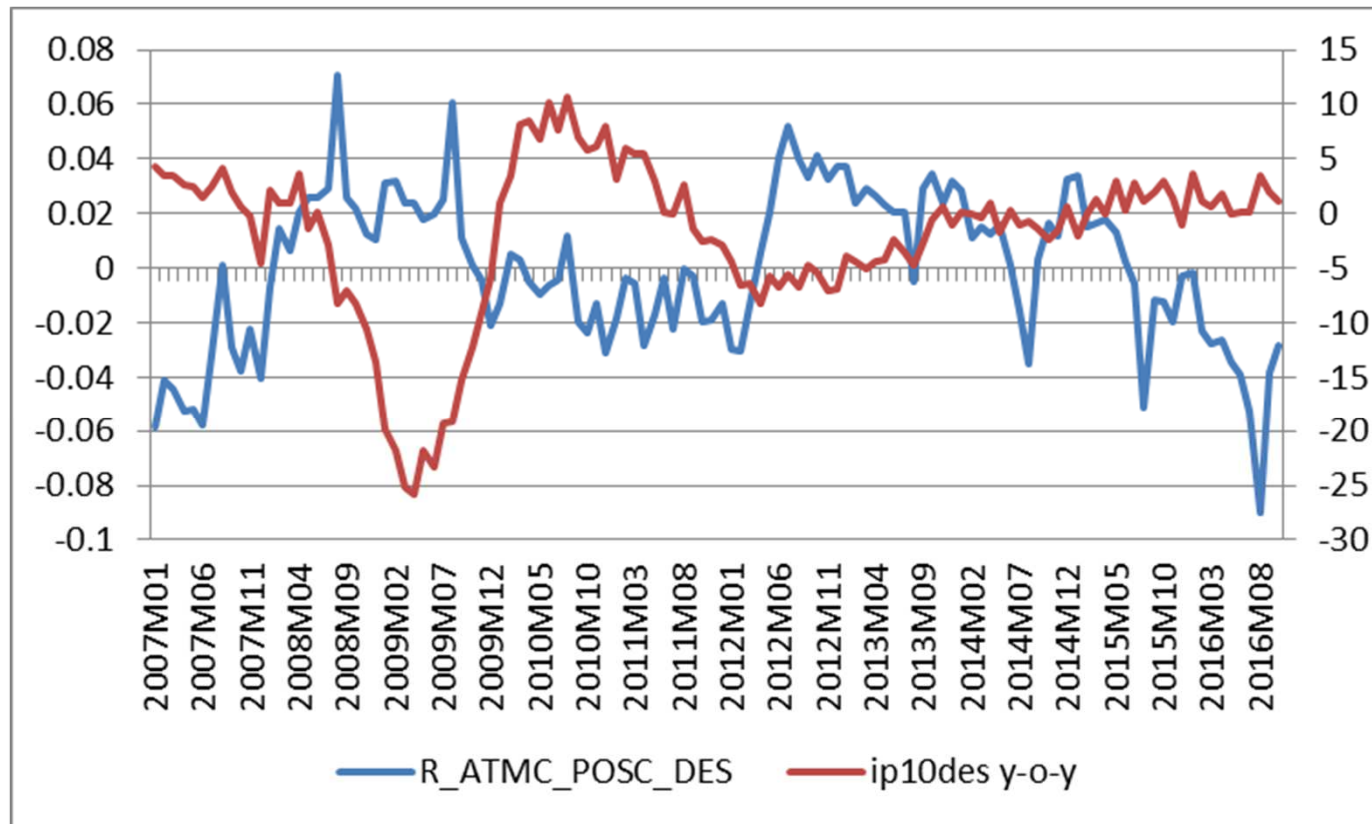


Keyword

Controlling for consumer payment habits

- The target variables in the retail payment systems represent a stable proxy of the retail payment market
- A large share of electronic transactions are recorded, including POS transactions and ATM cash operations.
- The value of ATM cash withdrawals may represent a good proxy of (untraced) cash transactions (ECB 2012).
- Substitution effects between cash and non-cash payments are under control; ensuring for the estimated parameters' stability in the long-run.

Cash: ATM/POS is counter-cyclical



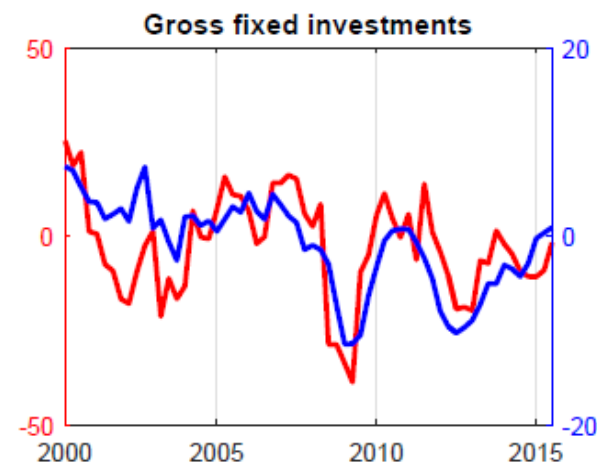
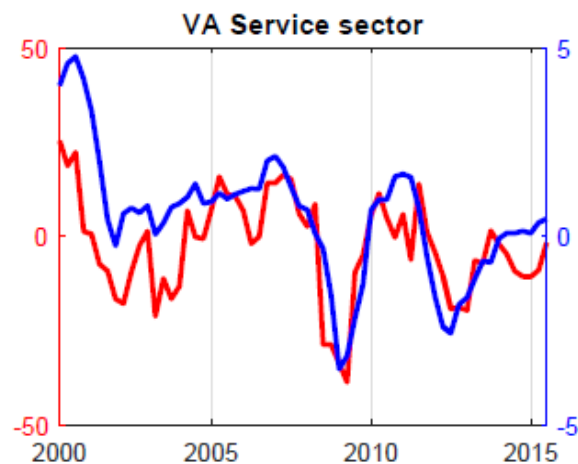
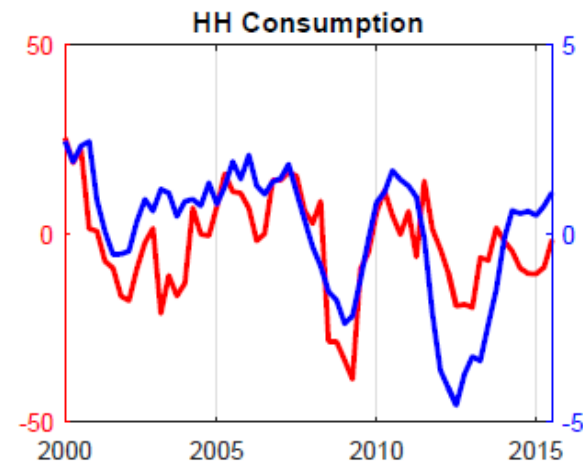
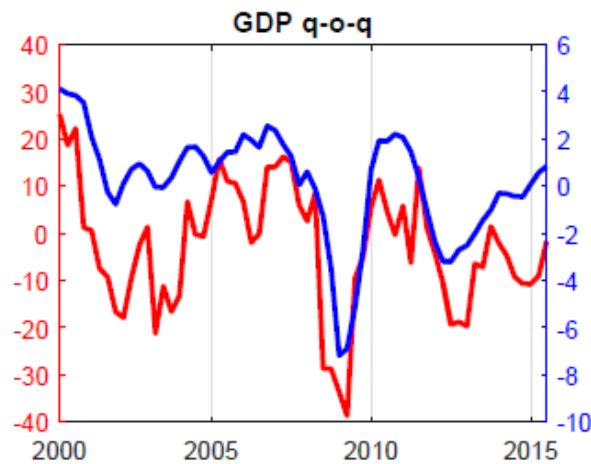
The correlation is -0.48.

Consistency with literature on cash demand



Payment data and macroeconomic aggregates

- Strong empirical evidence on the tight relationship between macro aggregates (bl) and payment flows (rl):



Payment data and macroeconomic aggregates

- Strong empirical evidence on the tight relationship between macro aggregates (bl) and payment flows (rl):

Correlation between payment flows and macroeconomic indicators

Payment flows	GDP	Private Consumption	Gross Fixed Investment	Value added service sector
BI-Comp	71.8	70.5	74.3	68.4
TARGET-retail	79.4	67.7	64	74.3
BI-Comp + T2	90.7	82.5	82.3	85.9
Other indicators				
M2	-38.1	-11.5	-20.4	-45.6
Industrial production	92.8	68.7	74.3	79.8
Business Confidence	68.5	74.9	67.3	64.3
Consumer Confidence	9.9	40.0	14.3	19.7

targeted predictors

- We started to compile $N = 50$ variables spanning economic activity sin Jan 2000 up to November 2015
- LASSO selected nL targeted predictors (*industrial and service acvity, households/ consumption, financial indexed, credit flows other than PD*)
- Post-LASSO approach to include some other indicators (*labor market evolution (household survey), current level of orders and production, liquidity constraint (business survey)*)
- We feed the information set with as many indicators as possible to fairly assess the forecasting ability of the PD

Targeted predictors

N-sample compared to LASSO and post-LASSO samples

Indicators	Source	Treatment	Lasso selected	Added to Lasso selection
Total electricity consumption	Italian Electrical Net Society	(1-L)logSA	yes	yes
Industrial production	Istat	(1-L)log	yes	yes
Business Climate	Istat	SA	yes	yes
CCS - Future General Economic sit.	Istat	SA	yes	yes
CCS - Future Personal Economic sit.	Istat	SA	yes	yes
CCS - Unemployment exp.	Istat	SA	no	yes
CCS - Saving opportunities, next 12 mth	Istat	SA	yes	yes
CCS - Households balance sheet	Istat	(1-L)	yes	yes
CCS - Current saving opportunities	Istat	SA	no	yes
BCS - Current level of orders (intermediate goods)	Istat	SA	no	yes
BCS - Current level of production (int. goods)	Istat	SA	no	yes
BCS - Exp. level of production (int. goods)	Istat	SA	no	yes
BCS - Exp. level of orders (int. goods)	Istat	SA	no	yes
BCS - Future general economic sit. (int. goods)	Istat	SA	no	yes
BCS - Exp. level of liquidity (int. goods)	Istat	SA	no	yes
BCS - Current level of liquidity (int. goods)	Istat	SA	no	yes
BCS - Current level of orders (investment goods)	Istat	SA	no	yes
BCS - Current level of production (inv. goods)	Istat	SA	no	no
BCS - Current level of liquidity (inv. goods)	Istat	SA	no	no
BCS - Exp. level of orders (inv. goods)	Istat	SA	no	no
BCS - Exp. level of production (inv. goods)	Istat	SA	no	no
BCS - Future General Economic sit. (inv. goods)	Istat	SA	no	no
BCS - Exp. level of liquidity (inv. goods)	Istat	SA	no	no
BCS - Current level of orders (consumer goods)	Istat	SA	no	no
BCS - Current level of production (cons. goods)	Istat	SA	no	no
BCS - Exp. level of orders (cons. goods)	Istat	SA	yes	yes
BCS - Exp. level of production (cons. goods)	Istat	SA	no	no
BCS - Future General Economic sit. (cons. goods)	Istat	SA	yes	yes
BCS - Exp. level of liquidity (cons. goods)	Istat	SA	no	no
BCS - Current level of liquidity (cons. goods)	Istat	SA	no	no
Current accounts deposits (stock)	Bank of Italy	(1-L)logSA	no	no
Credit flows to firms	Bank of Italy	(1-L)logSA	no	no
HICP	Istat	(1-L)logSA	no	yes
FTSE Italy (Banks)	Datastream	(1-L)log	no	no
FTSE Italy (Insurance)	Datastream	(1-L)log	no	no
FTSE Italy (Transport)	Datastream	(1-L)log	no	no
PMI Services - Business activity	Markit	SA	no	no
PMI Services - New business	Markit	SA	yes	yes
PMI Manufacturing - New orders	Markit	SA	yes	yes
PMI Manufacturing - Output	Markit	SA	no	no
PMI Manufacturing - New orders	Markit	SA	no	no
PMI Manufacturing - Employment	Markit	SA	no	no
PMI Manufacturing - New export orders	Markit	SA	no	no
Freight truck	ASPI	(1-L)logSA	yes	yes
Retail trade - goods	Confcommercio	SA	yes	yes
Retail trade - services	Confcommercio	SA	no	no
BI-COMP	Bank of Italy	(1-L)logSA	no	no
TARGET RETAIL	Bank of Italy	(1-L)logSA	yes	yes
Payment system-total	Bank of Italy	(1-L)logSA	no	no

The model

- **Dynamic factor model** (to manage many indicators)
- **Mixed-Frequency-Approach so called “MIDAS”** (to consider variables with different frequency)
- **Kalman smoothing** (to project missing observations at the end of the sampling period)
- **Forecasting application of the GDP**
 - Pseudo real-time out-of-sample evaluation on two bouts [2008.Q2-2015.Q2] and [2011.Q3-2015.Q2]
 - 68-months rolling windows
 - Forecasting horizons $h=-1,0,1,2$

Results (1)

- We compare \hat{I} and \hat{I}_{SP}
- out-of-sample forecasts (pseudo real-time simulations)
- Rolling window (length 68 months)

r-RMSFE of $\hat{I}_{T2,BC}$ vis-à-vis \hat{I}_{PS}

		Backcast	Nowcast	Forecast 1-step	Forecast 2-steps
GDP	2008.Q2 - 2015.Q2	0.89	0.97	1.07	1.10
	2011.Q3 - 2015.Q2	1.78	1.53	1.05	1.01

Relative RMSFE > 1 → better performance of SP model

Results (2)

..adding forecast results for Household Consumption, Gross Fixed Investment and Value Added Service Sector

r-RMSFE of $\hat{I}_{T2,BC}$ vis-à-vis \hat{I}_{PS}

		Backcast	Nowcast	Forecast 1-step	Forecast 2-steps
HC	2008.Q2 - 2015.Q2	1.19	1.20	1.13	1.10
	2011.Q3 - 2015.Q2	1.07	1.07	1.06	1.06
GFI	2008.Q2 - 2015.Q2	1.22	1.10	1.24	1.22
	2011.Q3 - 2015.Q2	0.88	0.84	1.10	1.06
VAS	2008.Q2 - 2015.Q2	1.04	1.14	1.15	1.19
	2011.Q3 - 2015.Q2	1.09	1.08	1.00	1.03
GDP	2008.Q2 - 2015.Q2	0.89	0.97	1.07	1.10
	2011.Q3 - 2015.Q2	1.78	1.53	1.05	1.01

Relative RMSFE > 1 → better performance of SP model

Wrap up and future researches

- The flows of retail payments
 - track the short-term evolution of the economic activity
 - stand out among other business cycle indicators
- Further work: Big data? Regional breakdown?
- Preliminary evidence on the correlation between payment data and economic uncertainty indicators



Thanks!