Online Appendix

The Usefulness of the Median CPI in Bayesian VARs used for Macroeconomic Forecasting and Policy

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This document is a companion to the paper that has the same title as this one.

SECTION A1   A Description of the BVAR models we employ

Name	Literature Referenced	Variables (transformations)	Hyperparameters	Frequency
BVAR1	Beauchemin and Zaman (2011)	Real GDP (log-level) Unemployment rate (level) Consumer Price Index (log-level) Consumer Price Index ex food and energy (log-level) Effective federal funds rate (level) Nonfarm business compensation (log-level) Nonfarm business productivity (log-level) Real personal consumption expenditures (log-level) Real personal disposable income (log-level) Payroll employment: total nonfarm (log-level) KR-CRB spot commodity price index: all commodities (log-level) 10-year Treasury note yield at constant maturity (level) Moody's seasoned Aaa corporate bond yield (level) S&P 500 composite stock price index (log-level) S&P 500 composite dividend yield (level) Trade weighted exchange value of the US$ vs. major currencies (log-level)	$\lambda = \max(ML)$ $\mu = \max(ML)$	Quarterly

Name	Literature Referenced	Variables (transformations)	Hyperparameters	Frequency
BVAR2	Banbura, Giannone, and Reichlin (2010)	Payroll employment: total nonfarm (log-level) Consumer Price Index (log-level) Consumer Price Index ex food and energy (log-level) Effective federal funds rate (level)	$\lambda = \infty$ $\mu = \infty$	Monthly

Name	Literature Referenced	Variables (transformations)	Hyperparameters	Frequency
BVAR3	Banbura, Giannone, and Reichlin (2010) Christiano, Eichenbaum, and Evans (1999)	Payroll employment: total nonfarm (log-level) Consumer Price Index (log-level) Consumer Price Index ex food and energy (log-level) Effective federal funds rate (level) Index of sensitive materials prices (log-level) Money stock: M2 (log-level) Depository Institutions Reserves: Total (log-level) Depository Institutions Reserves: Nonborrowed (log-level)	$\lambda = 0.262$ $\mu = 10*0.262$	Monthly

Name	Literature Referenced	Variables (transformations)	Hyperparameters	Frequency
BVAR4	Banbura, Giannone, and Reichlin (2010) Christiano, Eichenbaum, and Evans (1999)	Payroll employment: total nonfarm (log-level) Consumer Price Index (log-level) Consumer Price Index ex food and energy (log-level) Effective federal funds rate (level) Unemployment rate (level) Personal income less transfer payments (log-level) Manufacturing capacity utilization (level) Industrial production (log-level) Housing starts (log-level) Producer Price Index: finished goods (log-level) Average hourly earnings (log-level) M1 (log-level) S&P 500 composite stock price index (log-level) Index of sensitive materials prices (log-level) Money stock: M2 (log-level) Depository Institutions Reserves: Total (log-level) Depository Institutions Reserves: Nonborrowed (log-level) 10-year Treasury note yield at constant maturity (level) Trade weighted exchange value of the US$ vs. major currencies (log-level)	$\lambda = 0.108$ $\mu = 10*0.108$	Monthly

Name	Literature Referenced	Variables (transformations)	Hyperparameters	Frequency
BVAR5	Carriero, Clark, and Marcellino (2015)	Unemployment rate (level) Consumer Price Index (log-change, annualized rate) Consumer Price Index ex food and energy (log-change, annualized rate) Payroll employment: total nonfarm (log change, annualized rate) Weekly hours worked (level) Initial claims for unemployment insurance (level) Nominal retail sales (log change, annualized rate) UM Index of Consumer Sentiment (level) Single-family housing starts (log change) Industrial production (log change, annualized rate) Manufacturing capacity utilization (level) ISM PMI: Index of supplier delivery times (level) ISM PMI: Index of new orders (level) West Texas Intermediate spot price (log change) Effective federal funds rate (level) S&P 500 (log change) 10-year Treasury note yield at constant maturity (level) Trade weighted exchange value of the US$ vs. major currencies (log-level)	$\lambda = 0.2$ $\mu = 1$ $\tau = 1$	Monthly

Name	Literature Referenced	Variables (transformations)	Hyperparameters	Frequency
BVAR6	Carriero, Clark, and Marcellino (2015)	Unemployment rate (level) **PCE Price Index (log-change, annualized rate)** **PCE Price Index ex food and energy (log-change, annualized rate)** Payroll employment: total nonfarm (log change, annualized rate) Weekly hours worked (level) Initial claims for unemployment insurance (level) Nominal retail sales (log change, annualized rate) UM Index of Consumer Sentiment (level) Single-family housing starts (log change) Industrial production (log change, annualized rate) Manufacturing capacity utilization (level) ISM PMI: Index of supplier delivery times (level) ISM PMI: Index of new orders (level) West Texas Intermediate spot price (log change) Effective federal funds rate (level) S&P 500 (log change) 10-year Treasury note yield at constant maturity (level) Trade weighted exchange value of the US$ vs. major currencies (log-level)	$\lambda = 0.2$ $\mu = 1$ $\tau = 1$	Monthly

Name	Literature Referenced	Variables (transformations)	Hyperparameters	Frequency
BVAR7	Beauchemin and Zaman (2011)	Real GDP (log-level) Unemployment rate (level) **PCE Price Index** (log-level) **PCE Price Index ex food and energy** (log-level) Effective federal funds rate (level) Nonfarm business compensation (log-level) Nonfarm business productivity (log-level) Real personal consumption expenditures (log-level) Real personal disposable income (log-level) Payroll employment: total nonfarm (log-level) KR-CRB spot commodity price index: all commodities (log-level) 10-year Treasury note yield at constant maturity (level) Moody's seasoned Aaa corporate bond yield (level) S&P 500 composite stock price index (log-level) S&P 500 composite dividend yield (level) Trade weighted exchange value of the US$ vs. major currencies (log-level)	$\lambda = \max(ML)$ $\mu = \max(ML)$	Quarterly

Table A2: Forecast Comparison of BVAR in Beauchemin and Zaman (2011) --- Pre-Crisis

Relative Mean Squared Error (RMSE) --- relative to BVAR1								
A2a: BVAR1 vs. BVAR1 with median CPI inclusion								
	h=1Q	h=2Q	h=3Q	h=4Q	h=5Q	h=6Q	h=7Q	h=8Q
Real GDP growth	1.002	**0.999**	1.011	1.007	1.002	1.011	1.011	1.005
Core CPI inflation	**0.946**	**0.946**	**0.931**	**0.938**	**0.935**	**0.933**	**0.945**	**0.953**
Headline CPI inflation	**0.968**	**0.968**	**0.967**	**0.941**	**0.940**	**0.950**	**0.949***	**0.950****
Unemployment Rate	1.007	1.006	1.012	1.016	1.017	1.018	1.018	1.019
Fed Funds Rate	**0.999**	**0.985**	**0.975**	**0.967**	**0.962**	**0.960***	**0.956***	**0.958**
A2b: BVAR1 vs. BVAR1 with median CPI replacing the core CPI								
	h=1Q	h=2Q	h=3Q	h=4Q	h=5Q	h=6Q	h=7Q	h=8Q
Real GDP growth	1.023	1.011	1.006	1.005	**0.996**	1.007	1.006	**0.996**
Core CPI inflation	-----	-----	-----	-----	-----	-----	-----	-----
Headline CPI inflation	**0.966**	**0.960**	**0.964**	**0.938**	**0.938**	**0.954**	**0.959**	**0.966**
Unemployment Rate	1.018	1.011	1.030	1.027	1.022	1.018	1.014	1.011
Fed Funds Rate	**0.986**	**0.978**	**0.974**	**0.966**	**0.958**	**0.955**	**0.947***	**0.946***

Notes for the table: The table A2a lists the mean squared forecast error (MSFE) of the modified Bayesian VAR with Median CPI added to it relative to the mean squared forecast error of the modified BVAR1. The table 1b lists the mean squared forecast error (MSFE) of the modified BVAR1 in which core CPI is replaced with Median CPI relative to the mean squared forecast error of the modified BVAR1. The reported RMSFEs are for the real GDP growth (quarterly at annual rate), core CPI inflation (quarterly at annual rate), headline CPI inflation (quarterly at annual rate), the unemployment rate, and the federal funds rate for h=1,2,…8 step head forecasts (i.e. 2 years out) for the **evaluation period 1987Q1 – 2007Q3**. Numbers in the bold indicate that the MSFE of the modified BVAR1 with Median CPI is less than the MSFE from the modified BVAR1.

*denotes significance at 5% level
**denotes significance at 10% level
(based on modified Diebold-Mariano test)

Table A3: Forecast Comparison of BVARs in Banbura et al. 2010 --- Pre-Crisis

Relative Mean Squared Error --- relative to BVARs in Banbura at al 2010							
SMALL BVAR (BVAR2) in Banbura et al. 2010							
A3a: BVAR2 vs. BVAR2 with median CPI inclusion							
	h=1M	h=6M	h=9M	h=12M	h=15M	h=18M	h=21M	h=24M
Payroll growth	1.036	**0.968**	**0.984**	**0.966**	**0.973**	1.065	1.126	1.187
Headline CPI inflation	1.008	1.048	**0.969**	**0.943**	**0.967**	**0.901**	**0.881**	**0.878**
Fed Funds Rate	**0.961**	1.043	1.068	1.074	**0.997**	**0.884**	**0.819**	**0.793**
A3b: BVAR2 with Core CPI vs. BVAR2 with median CPI							
	h=1M	h=6M	h=9M	h=12M	h=15M	h=18M	h=21M	h=24M
Payroll growth	1.014	1.072	1.066	**0.943**	**0.854**	**0.808**	**0.805**	**0.840**
Headline CPI inflation	**0.958**	**0.929**	**0.924**	**0.920**	**0.940**	**0.925**	**0.962**	**0.982**
Fed Funds Rate	**0.922**	**0.836**	**0.898**	1.039	1.049	1.018	**0.974**	**0.947**
CEE BVAR (BVAR3) in Banbura et al. 2010							
A3c: BVAR3 vs. BVAR3 with median CPI inclusion							
	h=1M	h=6M	h=9M	h=12M	h=15M	h=18M	h=21M	h=24M
Payroll growth	**0.980**	1.000	1.024	1.015	1.023	1.039	1.061	1.096
Headline CPI inflation	1.026	1.026	1.016	**0.962**	**0.995**	**0.978**	**0.960**	**0.967**
Fed Funds Rate	**0.940**	**0.994**	1.017	**0.990**	**0.972**	**0.954**	**0.922**	**0.901**
A3d: BVAR3 with Core CPI vs. BVAR3 with median CPI							
	h=1M	h=6M	h=9M	h=12M	h=15M	h=18M	h=21M	h=24M
Payroll growth	1.031	1.060	1.048	1.033	1.026	1.035	1.072	1.093
Headline CPI inflation	1.000	1.011	1.014	**0.969**	1.007	**0.998**	**0.986**	**0.993**
Fed Funds Rate	**0.977**	1.037	1.053	1.058	1.042	1.022	**0.985**	**0.957**

Medium BVAR (BVAR4) in Banbura et al. 2010							
A3e: BVAR4 vs. BVAR4 with median CPI inclusion							
	h=1M	h=6M	h=9M	h=12M	h=15M	h=18M	h=21M	h=24M
Payroll growth	**0.990**	1.001	1.006	1.006	1.005	1.003	1.008	1.018
Headline CPI inflation	**0.997**	**0.990**	**0.996**	**0.960****	**0.982**	**0.979***	**0.973****	**0.982**
UR	**0.999**	**0.986**	**0.995**	1.004	1.010	1.013	1.014	1.015
Fed Funds Rate	**0.960**	**0.952***	**0.970**	**0.968**	**0.967**	**0.962**	**0.947**	**0.933***

A3f: BVAR4 with Core CPI vs. BVAR4 with median CPI							
	h=1M	h=6M	h=9M	h=12M	h=15M	h=18M	h=21M	h=24M
Payroll growth	1.008	1.013	1.004	1.003	1.008	1.014	1.042	1.045
Headline CPI inflation	**0.996**	**0.991**	**0.998**	**0.960****	**0.981**	**0.982**	**0.973***	**0.984**
UR	1.005	1.030	1.054	1.052	1.046	1.039	1.031	1.027
Fed Funds Rate	1.006	**0.994**	**0.988**	**0.981**	**0.975**	**0.969**	**0.951**	**0.933**

Notes for the table: The tables A3a-A3f lists the mean squared forecast error (MSFE) of the BVAR with Median CPI added to it relative to the mean squared forecast error of the BVAR without it. The reported RMSFEs are for the payroll growth (monthly at annual rate), core CPI inflation (monthly at annual rate), headline CPI inflation (monthly at annual rate), the unemployment rate, and the federal funds rate for h=1,2,…24 step head forecasts (i.e. 2 years out) for the **evaluation period 1987M1 – 2007M09**. Numbers in the bold indicate that the MSFE of the BVAR with Median CPI is less than the MSFE from the BVAR without Median CPI.

*denotes significance at 5% level
**denotes significance at 10% level
(based on modified Diebold-Mariano test)

Table A4: Forecast Comparison of Benchmark BVAR in Carriero et al (2011) --- Pre-Crisis

Relative Mean Squared Error --- relative to modified BVAR5							
A4a: BVAR5 vs. BVAR5 with median CPI inclusion							
	h=1M	h=6M	h=9M	h=12M	h=15M	h=18M	h=21M	h=24M
Payroll growth	**0.995**	**0.978**	1.010	1.016	1.017	1.012	1.008	1.022
Core CPI	**0.912*** **	**0.961**	**0.938**	**0.948**	**0.939**	**0.939**	**0.933**	**0.918**
Headline CPI	**0.978**	**0.982**	**1.006**	**0.947**	**0.981**	**0.989**	**0.988**	**0.976**
UR	1.004	**0.981**	**0.988**	**0.987**	**0.984**	**0.992**	**0.997**	**0.998**
Fed Funds Rate	1.026	**0.935**	**0.940**	**0.924**	**0.908**	**0.898**	**0.892**	**0.878**

A4b: BVAR5 vs. BVAR5 with median CPI replacing core CPI							
	h=1M	h=6M	h=9M	h=12M	h=15M	h=18M	h=21M	h=24M
Payroll growth	1.008	1.023	1.017	**0.999**	**0.991**	1.001	1.009	1.015
Core CPI	-----	-----	-----	-----	-----	-----	-----	-----
Headline CPI	**0.975**	**0.969**	**0.988**	**0.935***	**0.975**	**0.967**	**0.978**	**0.961***
UR	1.005	**0.992**	1.048	1.034	1.011	1.002	1.004	1.011
Fed Funds Rate	1.068	**0.946**	**0.967**	**0.957**	**0.927**	**0.918**	**0.912**	**0.900**

Notes for the table: The tables A4a-A4b lists the mean squared forecast error (MSFE) of the BVAR with Median CPI added to it relative to the mean squared forecast error of the BVAR without it. The reported RMSFEs are for the payroll growth (monthly at annual rate), core CPI inflation (monthly at annual rate), headline CPI inflation (monthly at annual rate), the unemployment rate, and the federal funds rate for h=1,2,…24 step head forecasts (i.e. 2 years out) for the **evaluation period 1987M1 – 2007M09**. Numbers in the bold indicate that the MSFE of the BVAR with Median CPI is less than the MSFE from the BVAR without Median CPI.

*denotes significance at 5% level
**denotes significance at 10% level
(based on modified Diebold-Mariano test)

Table A5: Exercise using the median CPI to forecast PCE-based inflation using Carriero et al (2011) Monthly BVAR--- Pre-Crisis

Relative Mean Squared Error --- relative to BVAR6								
A5a: BVAR6 vs. BVAR6 with median CPI inclusion								
	h=1M	h=6M	h=9M	h=12M	h=15M	h=18M	h=21M	h=24M
Payroll growth	1.003	1.017	1.049	1.015	**0.987**	**0.992**	1.010	1.032
Core PCE inflation	**0.965**	**0.972**	**0.959**	**0.968**	**0.931***	**0.907****	**0.894****	**0.872****
Headline PCE inflation	**0.961**	**0.955**	**0.972**	**0.949**	**0.943**	**0.923****	**0.934***	**0.911****
UR	1.005	**0.988**	1.023	1.026	1.003	**0.987**	**0.982**	**0.982**
Fed Funds Rate	1.010	**0.918****	**0.970**	**0.960**	**0.927**	**0.904**	**0.885**	**0.862***
A5b: BVAR6 vs. BVAR6 with median CPI replacing core PCE								
	h=1M	h=6M	h=9M	h=12M	h=15M	h=18M	h=21M	h=24M
Payroll growth	**0.987**	1.003	1.043	1.005	**0.984**	1.006	1.019	1.030
Core PCE inflation	-----	-----	-----	-----	-----	-----	-----	-----
Headline PCE inflation	**0.982**	**0.951**	**0.967**	**0.943**	**0.939**	**0.917****	**0.932***	**0.916****
UR	1.017	**0.961**	1.001	1.000	**0.968**	**0.955****	**0.964**	**0.979**
Fed Funds Rate	1.007	**0.902***	**0.953**	**0.933**	**0.889**	**0.867**	**0.851***	**0.832***

Notes for the table: The tables A5a-A5b lists the mean squared forecast error (MSFE) of the BVAR with Median CPI added to it relative to the mean squared forecast error of the BVAR without it. The reported RMSFEs are for the payroll growth (monthly at annual rate), core PCE inflation (monthly at annual rate), headline PCE inflation (monthly at annual rate), the unemployment rate, and the federal funds rate for h=1,2,…24 step head forecasts (i.e. 2 years out) for the **evaluation period 1987M1 – 2007M09**. Numbers in the bold indicate that the MSFE of the BVAR with Median CPI is less than the MSFE from the BVAR without Median CPI.

*denotes significance at 5% level
**denotes significance at 10% level
(based on modified Diebold-Mariano test)

Table A6: Exercise using the median CPI to forecast PCE-based inflation using Beauchemin and Zaman (2011) Quarterly BVAR--- Pre-Crisis

Relative Mean Squared Error (RMSE) --- relative to BVAR7								
A6a: BVAR7 vs. BVAR7 with median CPI inclusion								
	h=1Q	h=2Q	h=3Q	h=4Q	h=5Q	h=6Q	h=7Q	h=8Q
Real GDP growth	**0.997**	1.000	1.018	1.009	1.004	1.010	1.011	1.008
Core PCE inflation	**0.973**	**0.960**	**0.962**	**0.953**	**0.946***	**0.942***	**0.945***	**0.953**
Headline PCE inflation	**0.996**	**0.982**	**0.978**	**0.957**	**0.957**	**0.960***	**0.957***	**0.961**
Unemployment Rate	1.001	**0.999**	1.004	1.009	1.008	1.008	1.013	1.019
Fed Funds Rate	1.007	**0.994**	**0.996**	**0.995**	**0.987**	**0.980**	**0.972***	**0.970***
A6b: BVAR7 vs. BVAR7 with median CPI replace core PCE								
	h=1Q	h=2Q	h=3Q	h=4Q	h=5Q	h=6Q	h=7Q	h=8Q
Real GDP growth	**0.992**	1.000	1.016	1.010	1.003	1.004	**0.999**	**0.994**
Core PCE inflation	-----	-----	-----	-----	-----	-----	-----	-----
Headline PCE inflation	**0.998**	**0.987**	**0.983**	**0.961**	**0.965**	**0.974**	**0.972**	**0.981**
Unemployment Rate	**0.983**	**0.977**	**0.987**	**0.993**	**0.995**	**0.997**	1.003	1.009
Fed Funds Rate	**0.998**	**0.974**	**0.971**	**0.966**	**0.960***	**0.959***	**0.956***	**0.958**

Notes for the table: The tables A6a-A6b lists the mean squared forecast error (MSFE) of the BVAR with Median CPI added to it relative to the mean squared forecast error of the BVAR without it. The reported RMSFEs are for the real GDP growth (quarterly at annual rate), core PCE inflation (quarterly at annual rate), headline PCE inflation (quarterly at annual rate), the unemployment rate, and the federal funds rate for h=1,2,…8 step head forecasts (i.e. 2 years out) for the **evaluation period 1987Q1 – 2007Q3**. Numbers in the bold indicate that the MSFE of the BVAR with Median CPI is less than the MSFE from the BVAR without Median CPI.

*denotes significance at 5% level
**denotes significance at 10% level
(based on modified Diebold-Mariano test)

Table A7: Exercise using the forecasted values of the median CPI _as_ the forecast for core CPI with Beauchemin and Zaman (2011) Quarterly BVAR--- Pre-Crisis

Relative Mean Squared Error (RMSE) --- relative to BVAR1								
A7a: BVAR1 vs. BVAR1 in which we use Median CPI to predict Core CPI								
	h=1Q	h=2Q	h=3Q	h=4Q	h=5Q	h=6Q	h=7Q	h=8Q
Real GDP growth	1.023	1.011	1.006	1.006	**0.996**	1.007	1.006	**0.996**
Core CPI inflation	1.114	1.095	**0.996**	**0.937**	**0.915**	**0.896**	**0.903**	**0.913**
Headline CPI inflation	**0.966**	**0.960**	**0.964**	**0.938**	**0.938**	**0.954**	**0.959**	**0.966**
Unemployment Rate	1.018	1.011	1.030	1.027	1.022	1.018	1.014	1.011
Fed Funds Rate	**0.986**	**0.978**	**0.974**	**0.966**	**0.958**	**0.955**	**0.947***	**0.946***

Notes for the table: The table A7a lists the mean squared forecast error (MSFE) of the BVAR (which is estimated using Median CPI and uses the forecasts of the Median CPI to predict core CPI) relative to the mean squared forecast error of the BVAR without Median CPI. The reported RMSFEs are for the real GDP growth (quarterly at annual rate), core CPI inflation (quarterly at annual rate), headline CPI inflation (quarterly at annual rate), the unemployment rate, and the federal funds rate for h=1,2,...8 step head forecasts (i.e. 2 years out) for the **evaluation period 1987Q1 – 2007Q3**. Numbers in the bold indicate that the MSFE of the BVAR with Median CPI is less than the MSFE from the BVAR without Median CPI.

*denotes significance at 5% level
**denotes significance at 10% level
(based on modified Diebold-Mariano test)

Table A8: Exercise using the forecasted values of the median CPI _as_ the forecast for core CPI with Carriero et al (2011) Monthly BVAR--- Pre-Crisis

Relative Mean Squared Error --- relative to BVAR5								
A8a: BVAR5 vs. BVAR5 in which Median CPI is used to predict core CPI								
	h=1M	h=6M	h=9M	h=12M	h=15M	h=18M	h=21M	h=24M
Payroll growth	**0.973**	1.020	1.015	**0.996**	**0.988**	**0.997**	1.006	1.013
Core CPI	**0.907**	**0.954**	**0.904**	**0.984**	**0.996**	**0.954**	**0.900**	**0.848**
Headline CPI	**0.983**	**0.969**	**0.994**	**0.937***	**0.969**	**0.964**	**0.976**	**0.965**
UR	1.001	**0.989**	1.046	1.033	1.012	1.003	1.005	1.012
Fed Funds Rate	1.052	**0.945**	**0.966**	**0.955**	**0.927**	**0.920**	**0.915**	**0.903**

Notes for the table: The table A8a lists the mean squared forecast error (MSFE) of the BVAR (which is estimated using Median CPI and uses the forecasts of the Median CPI to predict core CPI) relative to the mean squared forecast error of the BVAR without Median CPI. The reported RMSFEs are for the payroll growth (monthly at annual rate), core CPI inflation (monthly at annual rate), headline CPI inflation (monthly at annual rate), the unemployment rate, and the federal funds rate for h=1,2,…24 step head forecasts (i.e. 2 years out) for the **evaluation period 1987M1 – 2007M09**. Numbers in the bold indicate that the MSFE of the BVAR with Median CPI is less than the MSFE from the BVAR without Median CPI.

*denotes significance at 5% level
**denotes significance at 10% level
(based on modified Diebold-Mariano test)