Central Bank Review xxx (xxxx) xxx

Contents lists available at ScienceDirect

Central Bank Review

journal homepage: http://www.journals.elsevier.com/central-bank-review/

Oil price shocks and the composition of current account balance☆

Serdar Varlik [a], M. Hakan Berument [b,*]

[a] Department of Economics, Hitit University, 19040, Corum, Turkey
[b] Department of Economics, Bilkent University, 06800, Ankara, Turkey

ARTICLE INFO

Article history:
Received 10 November 2019
Received in revised form
26 January 2020
Accepted 12 February 2020
Available online xxx

JEL classification:
F14
F17
Q40

Keywords:
Oil prices
Current account balance
FAVAR

ABSTRACT

It is a well-established regularity that permanent oil price shocks do not have a permanent effect on the current account deficit. This requires that sub-components of the current account or trade balance will make the necessary adjustments to accommodate the higher energy bill of a country triggered by permanent crude oil price increases. Empirical evidence gathered from Turkey reveals that, in the long run, balancing the current account is provided by a permanent increase in the net exports of Agricultural Production, Maintenance and Repair Services, Travel, Construction, Financial Services, Compensation of Employees, and Goods under Merchanting (non-tradable components of the current account balance); and a permanent decrease in the net exports of Mining, Fishery, Other Goods for BEC Classification, Investment Income, Manufacturing Services on Physical Inputs Owned by Others, and Transport balances mostly in sectors that use energy heavily in production. All these responses are found to be statistically significant in the more than 24 periods we consider in this study.

1. Introduction

The balance of payments of energy-poor countries is vulnerable to sudden oil price shocks, which affects the overall economy through the current account balance (Kaminsky et al., 1998; and Kaminsky and Reinhart, 1999). For oil-importing countries, as the consumption expenditures cannot be reduced immediately after oil price shocks, the initial effect, in the short-term, of oil price increases is a deterioration in the current account balance. Following the initial effect, over time, as consumption expenditures decrease, the current account improves and turns to the pre-shock state or surplus (Agmon and Laffer, 1978). This movement of the current account against oil price shock is similar to the *J*-curve shape.

The initial studies in the literature, which focus on the impact of change in terms of trade induced by oil price shock on the current account balance, reflect the intertemporal aspects. These studies, differentiating temporary and permanent oil price shocks, examine the rebalancing process of the current account balance following the oil price shock. Under the *flexible wages* and *full employment* assumptions, Sachs (1981, 1982) and Obstfeld (1980, 1982) consider that the permanent deterioration of terms of trade induced by the oil price shock triggers to increase savings in order to restore the wealth by accumulating foreign assets and, consequently, the current account balance of the oil-importing country improves.[1] However, Svensson (1984) notes that the response of the current account balance is ambiguous for permanent oil price increases under the assumption of rigid wages.

Subsequent studies focusing on intertemporal analyses emphasize that the current account unambiguously improves against temporary deterioration of terms of trade induced by the increase in oil price (see; Svensson and Razin, 1983; Greenwood, 1984; Persson and Svensson, 1985; Bean, 1986; Edwards, 1987; Frenkel and Razin, 1987; Matsuyama, 1988; Ostry, 1988; Sen and Turnovsky, 1989; Turnovsky and Sen, 1991; Otto, 2003; Huang

☆ We would like to thank the anonymous referees, the seminar participants at The Central Bank of the Republic of Turkey, as well as Faruk Aydın, Adnan Eken, Hakan Kara and Tara Sylvestre for their valuable suggestions.

* Corresponding author.
E-mail addresses: serdarvarlik@hitit.edu.tr (S. Varlik), berument@bilkent.edu.tr (M.H. Berument).
URL: http://berument.bilkent.edu.tr/

Peer review under responsibility of the Central Bank of the Republic of Turkey.

[1] These studies challenge the non-optimizing static model of Harberger (1950) and Laursen and Meltzer (1950) who claim that deterioration of terms of trade decreases real income and savings at given investment expenditure, fiscal policy and nominal income. This process ends with a deterioration of the current account balance.

https://doi.org/10.1016/j.cbrev.2020.02.002

and Meng, 2007; and Cardi, 2007). Moreover, in these studies, as the permanent oil price shock decreases the real income and expenditures by similar amounts, it is concluded that the current account balance will not be affected in the long term. On the other hand, Marion (1984), without making any distinction between temporary and permanent deteriorations, suggests that the current account balance improves overtime after the oil price shock. However, under the assumption that non-tradable goods are added to the analysis, Marion states that the improvement of the current account balance is no longer valid. In this case, production technology in tradable and non-tradable goods sectors determine the movements of the current account balance. In another important study, Van Vijnbergen (1985) shows that the increase in oil prices decreases the current account deficit when the investment expenditures are not taken into consideration. He argues that the increase in oil prices may lead to the current account surplus, even higher prices cause a recession.

Another set of studies directly examines the effect of oil price shocks. These studies elaborate on the short-term effects of oil price shocks on the current account balance. Baharumshah, Lau and Fountas (2003), Rebucci and Spatofora (2006), Aristovnik (2007), Gruber and Kamin (2007), Zaouali (2007), Bitzis et al. (2008), Schubert (2014), Kilian et al. (2009), Chuku et al. (2011), Le and Chang (2013), Narayan (2013), Baffes et al. (2015), and Huntington (2015) suggest that oil-importing countries have higher oil import bills due to the relative price inelasticity of oil demand, and so oil price shock increases the current account deficit in the short-term. However, these studies overlook the effect of oil price increases in the long-term.

The purpose of this paper is to study the effect of an oil price shock on the current account balance, as well as on the different sub-components of the current account balance over time. We assess this relationship for Turkey. There are several reasons for using Turkish data: (i) Turkey is a small oil-importing open economy. Crude oil import is an important component of the current account and trade (in) balance. Therefore, an increase in crude oil price deteriorates the current account balance. (ii) Most of the sectors in the Turkish economy are oil-dependent. Therefore, oil price movements have a significant effect on economic performance. (iii) Since the demand elasticity of crude oil is low, especially for the industrial sector, an increase in crude oil prices rises the crude oil expenditures of Turkey. Thus, this increases Turkey's oil bill.

There is a set of studies that examines the short-term effects of oil price shock on the current account balance for Turkey. Aytemiz and Şengönül (2008), Demirbaş et al. (2009), Peker and Hotunoğlu (2009), Özlale and Pekkurnaz (2010), Kayıkçı (2012), Bayat et al. (2013), and Özata (2014) find that oil price adversely affects the current account balance in the short-term. However, in these studies focusing on Turkey, after the oil price shock, the balancing process of the current account over time is disregarded.

Unlike previous studies, the original contribution of this paper is that it is the first study to examine how the increase in oil prices affects the different sub-components of the current account balance over time. Thus, after a permanent increase in oil price, it can be determined which sub-components provide the current account balance. The findings on the effects of crude oil prices on the sub-components of the current account balance are very important for policymakers because the estimation of when the effects will be observed, which sectors will be affected and how, if these effects will be permanent or not, and when the effect will reach its peak are important considerations when designing policies for those sectors. Overall, this paper is important since we analyze the effects of a crude oil price shock on the sub-components of the current account balance and employ a novel application to analyze the disaggregated data on the sub-components of Turkey's current account balance.

Our econometric method is designed to achieve this goal. The conventional Vector Autoregressive Models (VAR) usually have a limited number of variables in their specifications. However, the sub-components of a current account are numerous. Hence, in order to account for these variables, we will use the Factor Augmented Vector Autoregressive Model (FAVAR) employed by Bernanke et al. (2005). FAVAR includes large data sets that are reduced to a few factors without any significant loss of information and avoids the *low degrees of freedom* problem. Thus, FAVAR addresses the *omitted information* problem. On the other hand, Turkey is a small-oil importing open economy. Thus, Turkey is too small to affect the crude oil price in the world but is still affected by world crude oil prices. Therefore, we will use the Block Vector Autoregressive model employed by Cushman and Zha (1997). The mentioned two features will be indebted, for the first time, to an econometric specification that we call Block Exogeneity Factor Augmented VAR (BE-FAVAR). BE-FAVAR allows us to elaborate on the effects of positive innovations in an external variable (such as crude oil prices) on different domestic variables.

The empirical evidence gathered from Turkey reveals that a positive permanent innovation in the crude oil real price permanently increases energy import, then the different sub-components of the current account balance should adjust. When a positive permanent shock is given to crude oil real price, the adjustment of the current account balance in the long-term is provided by a permanent increase in the mainly net exports of non-tradable sub-components, and a permanently decrease in the net exports of the mostly tradable sub-components of the current account balance that heavily use energy as an important component of inputs. Against a crude oil real price shock, the net exports of Agricultural Production, Maintenance and Repair Services, Travel, Construction, Financial Services, Compensation of Employees, and Goods under Merchanting (trade of the imported products for export) permanently increase. However, the net exports of Mining, Fishery, Other Goods for BEC Classification, Investment Income, Manufacturing Services on Physical Inputs Owned by Others, and Transport balance on the current account permanently decrease. These results make sense since the price elasticities of the oil demand of the sectors related to the different sub-components of the current account will differ; thus the responses of these sub-components to the oil price shock differ. Therefore, the effect of a permanent increase in oil prices on the current account is expected to be balanced within some sub-components of the current account balance over time.

This paper is organized as follows: In Section 2, we introduce the extension of the FAVAR methodology employed by Bernanke et al. (2005) with block exogeneity specification employed by Cushman and Zha (1997). We provide empirical evidence in Section 3. In Section 4, we conclude the paper.

2. Method

Our econometric methodology is an extension of Bernanke et al.'s (2005) FAVAR modeling with the block exogeneity specification of Cushman and Zha's (1997). FAVAR modeling, employed by Bernanke et al. (2005), without any significant loss of information and the degrees of freedom problem, provides the use of large data sets by reducing them to a few common factors that explain the majority of the data sets. Thus, FAVAR overcomes the omitted information problem which is often found in standard limited-variable VAR models. The Block Exogeneity Structural Vector Autoregression model employed by Cushman and Zha (1997) is used here to capture for countries that are too small to affect world

Please cite this article as: Varlik, S., Berument, M.H., Oil price shocks and the composition of current account balance, Central Bank Review, https://doi.org/10.1016/j.cbrev.2020.02.002

oil prices but are still affected by foreign variables. Thus, we call our method Block Exogeneity Factor-Augmented VAR (BE-FAVAR).

Factor analyses can be used to capture a zero-mean, stationary time series as linear combinations of common components driven by a small number of factors, and idiosyncratic components. Let $X_t$be $N \times 1$ time series of 27 sub-components of the current account balance, real effective exchange rate, Euro/Dollar parity, industrial production, consumer price index, and producer price index in their stationary and zero mean form. N indicates the 'large' number of informational time series. Y_t is a vector of $M \times 1$ observable variables. In this study, Y_t represents crude oil real price. F_t is a $k\times 1$ vector of unobservable factors that have most of the information contained in X_t which cannot be estimated in the standard VAR approach. N is much higher than the number of factors $(N > k + M)$. Also, $\Phi(\mathrm{L}) = I - \Phi^*(L) = I - \Phi_1 L - \Phi_2 L^2 - \ldots - \Phi_d L^d$, $\Phi(L)$ indicates the appropriate lag of the mxm matrix polynomial of finite lag order d in the lag operator L. $\Phi_i(l = 1, \ldots d)$ is the coefficient matrix. υ_t is an mx1 vector of error term with zero mean.

2.1. The joint dynamics of F_t and Y_t can be written as[2]

$$\begin{bmatrix} F_t \\ Y_t \end{bmatrix} = \Phi^*(L)\begin{bmatrix} F_{t-1} \\ Y_{t-1} \end{bmatrix} + \upsilon_t \leftrightarrow \Phi(L)\begin{bmatrix} F_t \\ Y_t \end{bmatrix} = \upsilon_t \tag{1}$$

Equation (1) is a standard VAR but uses a vector of unobservable factors F_t and observable variable Y_t. $\begin{bmatrix} F_t \\ Y_t \end{bmatrix}$ is an mx1 vector of variables. However, Equation (1) is not reduced to a standard VAR in Y_t. Since Equation (1) has unobservable factors, we cannot directly estimate this standard VAR equation. In this case, Bernanke et al. (2005) estimate Equation (1) by using FAVAR.

In order to explain the dynamic factor model, assume that the informational time series $X_t$can be represented as a function of unobservable F_t and observable Y_t, such that

$$X_t = \Lambda^f F_t + \Lambda^y Y_t + e_t. \tag{2}$$

here, $\Lambda^f$is a $N \times k$ and Λ^y is an $N \times M$ matrix of the factor loadings, and $e_t$is an $N \times 1$ vector of error terms. In Equation (2), X_t depends only on the current values and not the lagged values of the factors.

The block exogeneity issue is captured with Cushman and Zha's (1997) block exogeneity specification. Our specification is as follows:

$$\Phi(L)\begin{bmatrix} F_t \\ Y_t \end{bmatrix} = \upsilon_t. \tag{3}$$

This specification can be presented in matrix form in Equation (4).

$$\Phi(L) = \begin{bmatrix} \Phi_{11}(L) & \Phi_{12}(L) \\ 0 & \Phi_{22}(L) \end{bmatrix}, \upsilon_t = \begin{bmatrix} \upsilon_1(t) \\ \upsilon_2(t) \end{bmatrix}. \tag{4}$$

The coefficient matrix of L^0 Φ^0, is non-singular and $\upsilon(t)$ is uncorrelated with past $\begin{bmatrix} F_t \\ Y_t \end{bmatrix}$s. $\Phi_{21}(L)$ are all zero, which captures the block exogeneity in the $\Phi(L)$ matrix, as suggested by Cushman and Zha (1997). Y_t is our external block, which comprises crude oil real price. F_t is our domestic block, which includes the main sub-components of the current account balance.

[2] For an excellent and easy-to-follow presentation of FAVAR methodology see Bernanke et al. (2005), Stock and Watson (1998, 2005), and Soares (2013).

3. Empirical evidence

Our econometric application comprises two stages. For both of these stages, our data span covers a monthly observation from December 2001 to March 2018 for Turkey. The beginning of our sample period is dictated by data availability. Table 1 reports codes, variable names, and sources of domestic and external blocks' data sets.

In the first stage, we estimate how crude oil real price shock affects the current account balance by using the Block Exogeneity VAR method employed by Cushman and Zha (1997). In the second stage, we examine the effects of crude oil real price shock to sub-components of the current account balance by using the Block Exogeneity Factor-Augmented VAR (BE-FAVAR) method.

3.1. The effects of oil price shock to the current account balance

In order to estimate the effects of crude oil real price shock to the current account balance, we use Block Exogeneity VAR. We determine that the lag order of the identified VAR model with block exogeneity is three by using the Schwarz Information Criteria. We also place constant term and 11 seasonal dummy variables to account for seasonality.

Our external block comprises the first difference of logarithmic crude oil real price. We calculate the crude oil real price data as the price of Brent-Europe (Dollars per barrel) divided by the US Consumer Price Index for Urban Consumers (All Items). Our domestic block includes the dollar-denominated current account balance for the current month as divided by twelve lag of the dollar-denominated interpolated monthly GDP,[3] the twelve-month difference of the logarithmic real effective exchange rate, the twelve-month difference of the logarithmic industrial production, and the twelve-month difference of the logarithmic producer price index. Furthermore, we include dollar-denominated capital flows over twelve lag of the dollar-denominated interpolated GDP, and world economic growth for domestic block and world economic growth for the external block as the control variables.[4] In order to determine whether these series have a long-run constant mean, we performed a set of unit root tests. The test statistics suggest that all of these series are stationary, and thus we treat them all as stationary.

Before reporting the FAVAR estimates, we estimate a model for the effect of crude real oil prices on the Turkish economic performance with a conventional Block Exogeneity VAR model. Here we did not include sub-components of the current account balance but rather the total current account balance. In order to identify the system, we use the Cholesky decomposition. The identification implies that the order of the variables is important. The variables are ordered as the twelve-month difference of the logarithmic producer price index, the twelve-month difference of the logarithmic industrial production, the dollar-denominated current account balance as divided by twelve lag of the dollar-denominated interpolated monthly GDP, the twelve-month difference of the logarithmic real effective exchange rate, and the first difference of the logarithmic crude real oil price. This ordering implies that the

[3] The reason for deflating current account balance sub-components with lagged GDP is to eliminate the simultaneity. Otherwise we could be capturing the effect of real oil prices on GDP.

[4] We include the world growth rate and capital flows as control variables rather than endogeneous variables into the system. The main reason for this is that the purpose of this paper is to assess the effects of oil prices shocks on the Tuırkish Current Account balance and its composition, rather than assessing the effects of these two varaibles. Modeling these two varaibles would increase number of parameters to be estiamted conisderably and would lead to less efficienmt estimates.

Table 1
Data sources.

Code	Variable Name	Sources
Current Account Balance Detailed Presentation (BPM6)		
TP.ODAYR6.Q001	I-CURRENT ACCOUNT-Level	EDDS
TP.ODAYR6.Q007	I-A.1.General merchandise on a balance of payments basis-Level	EDDS
TP.ODAYR6.Q016	I-A.2.Net exports of goods under merchanting (credit)-Level	EDDS
TP.ODAYR6.Q017	I-A.3.Nonmonetary gold-Level	EDDS
TP.ODAYR6.Q023	I—B.1.Manufacturing services on physical inputs owned by others-Level	EDDS
TP.ODAYR6.Q026	I—B.2.Maintenance and repair services n.i.e.-Level	EDDS
TP.ODAYR6.Q029	I—B.3.Transport-Level	EDDS
TP.ODAYR6.Q038	I—B.4.Travel-Level	EDDS
TP.ODAYR6.Q041	I—B.5.Construction-Level	EDDS
TP.ODAYR6.Q044	I—B.6.Insurance and pension services-Level	EDDS
TP.ODAYR6.Q047	I—B.7.Financial services-Level	EDDS
TP.ODAYR6.Q050	I—B.8.Other business services-Level	EDDS
TP.ODAYR6.Q053	I—B.9.Government goods and services n.i.e.-Level	EDDS
TP.ODAYR6.Q056	I—B.10.Other services-Level	EDDS
TP.ODAYR6.Q062	I—C.1.Compensation of employees-Level	EDDS
TP.ODAYR6.Q065	I—C.2.Investment income-Level	EDDS
TP.ODAYR6.Q084	I-D.1.General Government-Level	EDDS
TP.ODAYR6.Q085	I-D.2.Other Sectors-Level	EDDS
Foreign Trade Broad Economic Categorization (BEC)(TURKSTAT)		
TP.DT.ARA.IH.B	Intermediate Goods (Exports)-Level	EDDS
TP.DT.ARA.IT.B	Intermediate Goods (Imports)-Level	EDDS
TP.DT.DIG.IH.B	Other (Exports)-Level	EDDS
TP.DT.DIG.IT.B	Other (Imports)-Level	EDDS
TP.DT.GEN.IH.B	Total (Exports)-Level	EDDS
TP.DT.GEN.IT.B	Total (Imports)-Level	EDDS
TP.DT.SER.IH.B	Capital Goods (Exports)-Level	EDDS
TP.DT.SER.IT.B	Capital Goods (Imports)-Level	EDDS
TP.DT.TUK.IH.B	Consumption Goods (Exports)-Level	EDDS
TP.DT.TUK.IT.B	Consumption Goods (Imports)-Level	EDDS
Foreign Trade International Standard Industry Categorization(ISIC REVIZE 3)(TURKSTAT)		
TP.DT.BAL.IH.I	Fishing (Exports)-Level	EDDS
TP.DT.BAL.IT.I	Fishing (Imports)-Level	EDDS
TP.DT.DIG.IH.I	Others (Exports)-Level	EDDS
TP.DT.DIG.IT.I	Others (Imports)-Level	EDDS
TP.DT.GEN.IH.I	Total (Exports)-Level	EDDS
TP.DT.GEN.IT.I	Total (Imports)-Level	EDDS
TP.DT.IMA.IH.I	Manufacturing (Exports)-Level	EDDS
TP.DT.IMA.IT.I	Manufacturing (Imports)-Level	EDDS
TP.DT.MAD.IH.I	Mining and Quarrying (Exports)-Level	EDDS
TP.DT.MAD.IT.I	Mining and Quarrying (Imports)-Level	EDDS
TP.DT.TAR.IH.I	Agriculture and Forestry (Exports)-Level	EDDS
TP.DT.TAR.IT.I	Agriculture and Forestry (Imports)-Level	EDDS
Other Macroeconomic Variable and Oil Price		
TP RK T1 Y	Real Effective Exchange Rate	EDDS
EXUSEU	Euro Dollar Parity	FRED Data
	Mineral Fuels, Mineral Oils and Product of Their Distillation	Turkish Statistical Institute
TP ODAYR6 Q090	Capital and Financial Account	EDDS
TP ODAYR6 Q092		
TP GSYIH26 HY CF	Gross Domestic Product	EDDS
NYGNPMKTPCDWLD	Growth of World Output	FRED Data
TP SANAYREV4 Y1	Industrial Production	EDDS
TP FG JO	Consumer Price Index	EDDS
MCOILBRENTEU	Crude Oil Prices: Brent-Europe, Dollars per barrel	FRED Data

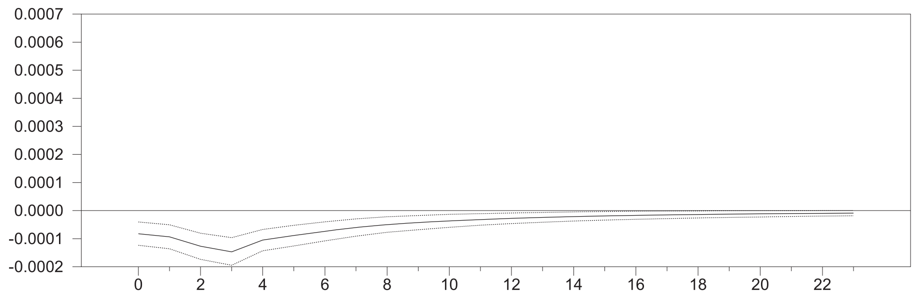
last variable affects all the previous variables, but is affected by none contemporaneously. Similarly, the first variable is affected by all the following variables. However, all the variables except the crude real oil prices affect each other with lag. The crude real oil prices are not affected by the domestic variables.

In order to identify the system, we use the Cholesky decomposition. The identification implies that the order of the variables in the domestic block is important. In the ordering, the preceding variables affect the latter variables, but not vice-versa contemporaneously. However, all the variables in the domestic block affect each other with a lag.

Fig. 1 reports the impulse response function when a one-standard-deviation shock is given to the crude oil real price growth rate for the current account balance only. The solid black line is for the impulse responses, and the two dotted lines are for one-standard-deviation confidence intervals for 24 horizons. Since real oil prices are $I(1)$, giving a one-standard-deviation shock to the growth rate of real oil prices means a permanent increase in real oil prices where oil price growth shock has an exponential decay on itself when we observe impulse responses. Fig. 1 suggests that a one-standard-deviation shock to the crude oil real price growth increases the current account deficit about 20 periods in a statistically significant fashion, but the effects die out in the long run.[5]

[5] The results of the impulse responses under the Cholesky decomposition may be sensitive to the ordering. The VAR models with alternative ordering are estimated. The results are mostly are robust. These estimates are not reported here to save space but are available from the authors upon a request.

Please cite this article as: Varlik, S., Berument, M.H., Oil price shocks and the composition of current account balance, Central Bank Review, https://doi.org/10.1016/j.cbrev.2020.02.002



Note: The solid lines represent the impulse responses. The dashed lines report one-standard-deviation the upper and lower bands for the impulse responses.

Fig. 1. Responses of Current Account Balance to Oil Price Shock

3.2. The effects of oil price shock to sub-components of the current account balance

Next, using the BE-FAVAR method, we estimate the effects of crude oil real price growth shock to sub-components of the current account balance for the same period. Our external block consists of the first difference of logarithmic crude oil real price, which is calculated as the price of Brent-Europe (Dollars per barrel) divided by the US Consumer Price Index for Urban Consumers (All Items). In the domestic block, we use the dollar-denominated sub-components of the current account balance for the current month as divided by twelve lag of the dollar-denominated interpolated monthly GDP, the twelve-month difference of the logarithmic real effective exchange rate, the twelve-month difference of the logarithmic Euro/Dollar parity, the twelve-month difference of the logarithmic industrial production, the twelve-month difference of the logarithmic producer price index, and the twelve-month difference of the logarithmic consumer price index. Also, we use the dollar-denominated capital flows over twelve lag of the dollar-denominated GDP and the world economic growth as control variables for the domestic block. Our control variable for the external block is the world economic growth. All of these series are stationary, and thus we treat them all as stationary.

In order to determine the number of factors for the domestic block variables, we use Bai and Ng's (2002) Factor Determination Test. The test results are reported in Table 2. Two of the test statistics suggest the number of common factors to be four, and one test statistics suggests five. Five factors explain 58% of the variation for the domestic block that we consider. Thus, we took the number of factors to be five.

Similar to the VAR specification in Section 3.1, the BE-FAVAR specification includes the constant term and 11 seasonal dummy variables to account for seasonality. Using the Schwarz Information Criteria, we determine that the lag order of the identified VAR model with block exogeneity is two.

Fig. 2 reports the impulse response functions of the sub-components of the current account balance when a one-standard-deviation shock is given to the crude oil real price growth rate. The solid black line is for the impulse responses, and the two dotted lines are for the one-standard-deviation confidence intervals for 24 horizons.[6] Fig. 2 suggests that a one-standard-deviation shock to the crude oil real price growth permanently increases the energy import that we consider. For the effects of crude real oil price shocks on the other sub-components of the current account deficit, the balancing of the current account, in the long run, is provided by a permanent increase (higher level of surplus or lower level of deficit) in Goods under Merchanting (that captures the trade of the imported products for export), Agricultural Production, Maintenance and Repair Services, Travel, Construction, Financial Services, and Compensation of Employees. All these responses are found to be statistically significant in the more than 24 periods that we consider. When a positive permanent shock is given to crude oil real price, Mining, Fishery, Other Goods for BEC Classification, Investment Income, Manufacturing Services on Physical Inputs Owned by Others, and Transport balance decrease in a statistically significant fashion in more than 24 periods. These are usually the sectors that energy is one of the most important inputs. Thus, our findings suggest that the long-term balancing process in the current account is mainly provided by services trade. On the other hand, Consumption Goods, Other Sectors, General Government, and Other Services increase statistically significantly against a positive permanent innovation in the crude oil real price, in the short run. However, when a positive permanent shock is given to crude oil real price, Manufacturing Industry, Capital Goods, Intermediate Goods and Government Goods and Services decrease in a statistically significant fashion in the short run.

Overall, we may claim that the correction comes in service or non-tradable industries' current account surpluses in the long-term. However, for the sectors that use energy as input for a significant part of production processes, then permanent deteriorations are observed. There might be various reasons for this. For example, first, when oil prices rise, then domestic currency depreciates as a shock absorber, and the service or non-tradable sectors may benefit from the competitiveness gain through relative prices more than tradable sectors because of their higher

Table 2
Bai-Ng's factor determination test and variance shares for net exports of main sub-components of current account balance.

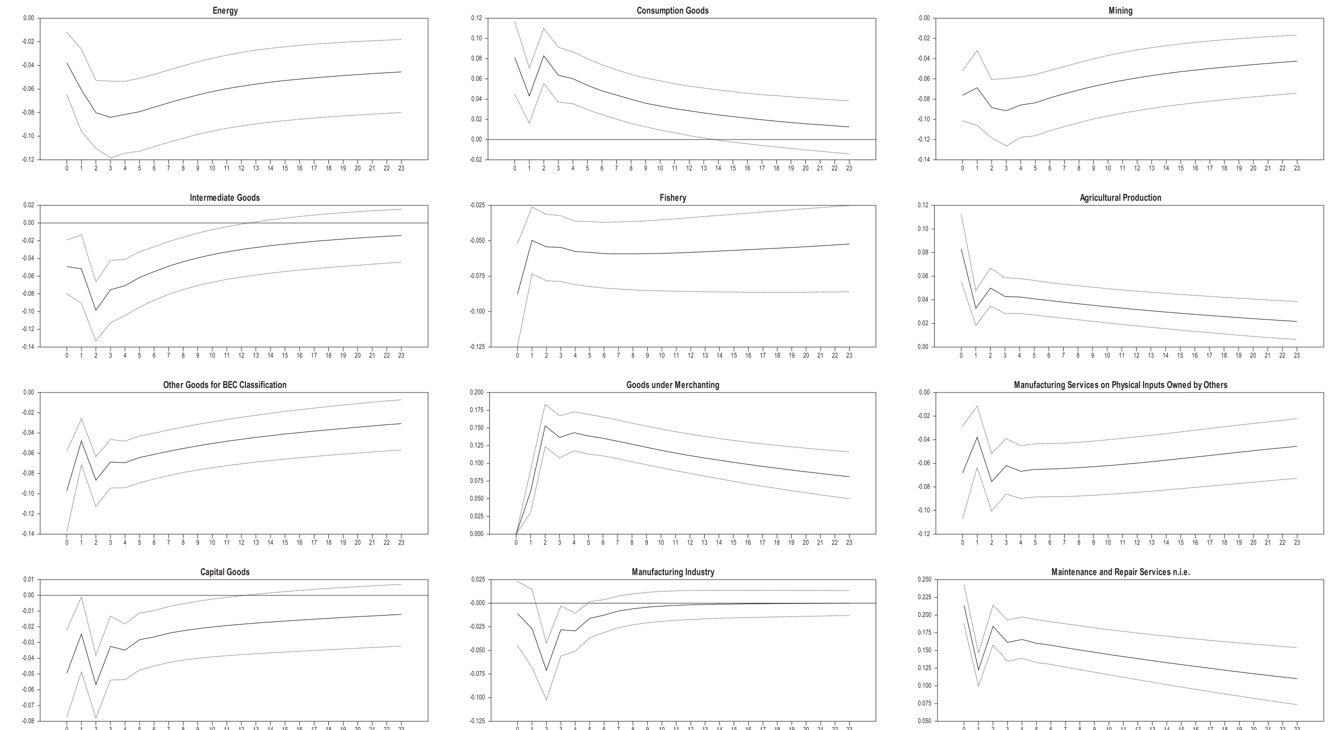
# Factors	PCP1	PCP2	PCP3	Cumulated Variance Share
1	0.7962	0.7909	0.7833	0.2081
2	0.7125	0.7019	0.6866	0.3620
3	0.6643	0.6483	0.6253	0.4595
4	0.6607[a]	0.6394[a]	0.6088	0.5298
5	0.6720	0.6454	0.6071[a]	0.5805
6	0.6864	0.65451	0.6085	0.6279
7	0.7089	0.6717	0.6180	0.6725
8	0.7332	0.6906	0.6293	0.7141
9	0.7601	0.7122	0.6432	0.7524
10	0.7902	0.7369	0.6603	0.7867

Note. [a] is for the number of optimum factors.

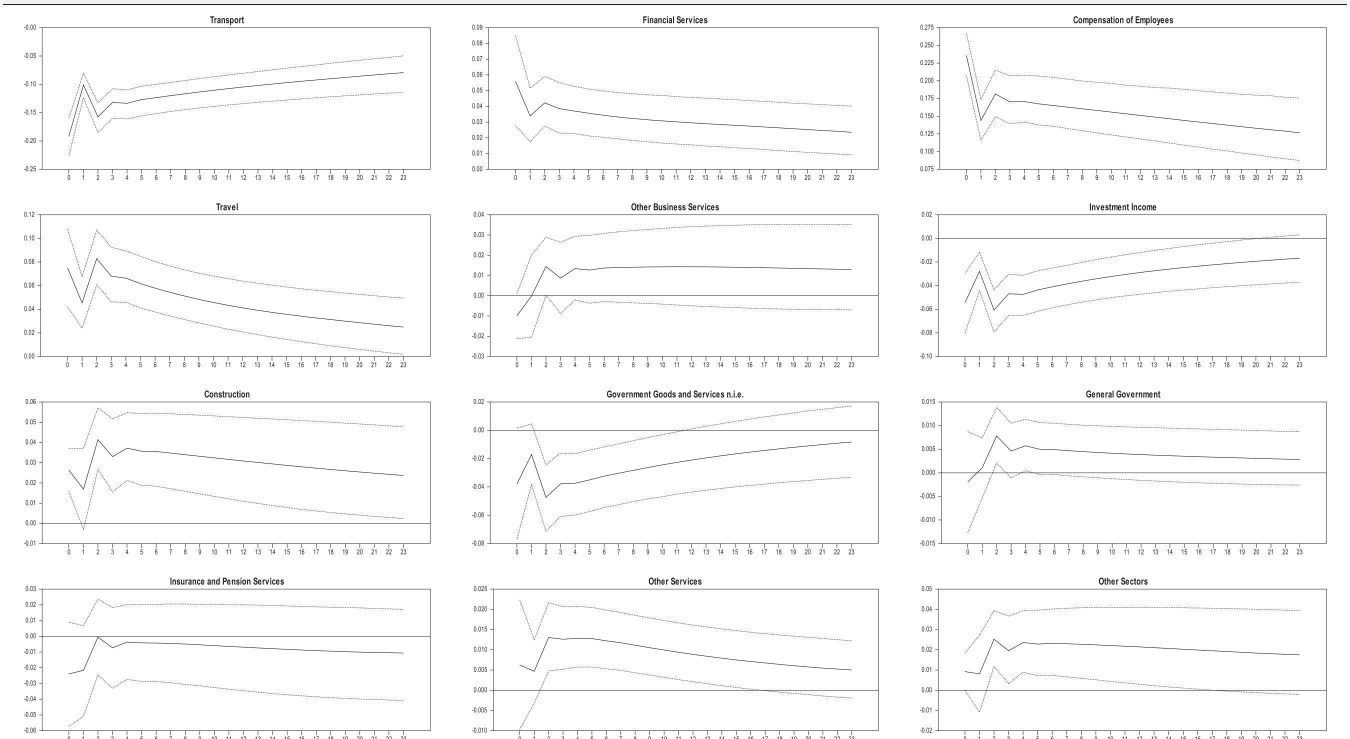
[6] Following Bernanke et al. (2005), we use the two-stage principal component method. Thus, we use the Kilian (1998) bootstrap methodology in order adjust the confidence interval with respect to error band for impulse response analysis due to uncertainty in factor estimates.

Please cite this article as: Varlik, S., Berument, M.H., Oil price shocks and the composition of current account balance, Central Bank Review, https://doi.org/10.1016/j.cbrev.2020.02.002

Responses of Net Exports of Main Sub-components of Current Account Balance over Twelve Monthly Lag of GDP to Oil Price Shock Once Capital Flows and World Economic Growth for Domestic Block and World Economic Growth for Oil Price are Controlled.



Note: The solid lines represent the impulse responses. The dashed lines report the upper and lower bands for the impulse responses.



Note: The solid lines represent the impulse responses. The dashed lines report the upper and lower bands for the impulse responses.

Fig. 2. Responses of Net Exports of Main Sub-components of Current Account Balance over Twelve Monthly Lag of GDP to Oil Price Shock Once Capital Flows and World Economic Growth for Domestic Block and World Economic Growth for Oil Price are Controlled.

Please cite this article as: Varlik, S., Berument, M.H., Oil price shocks and the composition of current account balance, Central Bank Review, https://doi.org/10.1016/j.cbrev.2020.02.002

domestic value-addition. Second, effects of higher oil price shocks can also be observed on the real wages of the service and non-tradable sectors; since wages in the latter sectors are more flexible than the tradable sectors, then an increase in oil price may cause a higher decrease in real wages in tradeable sectors and make them more competitive. Last, higher oil prices mean income transfer from oil-importing countries to oil-exporting countries, higher demand from the oil-exporting countries for the service or non-tradable sectors in the oil-importing countries may stimulate these sectors permanently as well (see Guidi, 2009).

As robustness tests, for the first alternative, different from the benchmark model, we re-performed the analyses under the same specification by using the first lag rather than the twelfth lag. In the second alternative, different from the benchmark model and the first alternative, we re-analyzed by changing our control variables. We used the dollar-denominated capital flows over the first lag of the dollar-denominated interpolated GDP as control variables for the domestic block, and the world economic growth as control variables for the external block. For the third alternative, we re-performed the analyses differently from the benchmark model in terms of control variables. We used the dollar-denominated capital flows over twelve lag of the dollar-denominated GDP as control variables for the domestic block, and world economic growth as control variables for the external block. All of these three robustness analyses reveal that our results are robust.[7]

4. Conclusion

Following the sudden oil price shocks, energy-importing-countries, which are vulnerable to increases in oil prices, cannot reduce the consumption expenditures immediately. Thus, increases in oil price deteriorate the current account balance of these countries. However, the current account balance improves just as consumption expenditures decrease over time. This response of the current account balance to oil price shocks being similar to the *J*-curve shape requires the adjustment of sub-components of the current account balance over time. Therefore, which sub-components of current account balance will be affected by an oil price shock, whether these impacts will be permanent and when these impacts will peak, are important for energy-importing countries.

The aim of this study is that the effects of a permanent increase in crude oil real prices on the current account balance and on different sub-components of the current account balance are examined for Turkey which is a small oil-importing open economy. Since we use a large data set and willing to capture block exogeneity assumption, our econometric method designing to examine the aim of this study requires to extend the Factor Augmented Vector Autoregressive Model (FAVAR) employed by Bernanke et al. (2005) with the Block Vector Autoregressive Model employed by Cushman and Zha (1997). We call this method Block Exogeneity Factor Augmented VAR (BE-FAVAR). Thus, BE-FAVAR, which is reduced the large data sets to a few common factors and captured the exogeneity assumption, allows us to examine the effects of positive innovations in an external variable (such as crude oil real prices) on different domestic variables (here on sub-components of current account balance) by overcoming the omitted information problem seen in standard limited-variable VAR models.

The studies in the literature either focus on the impact of change in terms of trade induced by the oil price shock on the current account balance or focus on the short-term effects of oil price shock on the current account balance. However, these studies overlook the effect of oil price shocks in the long-term. Unlike the previous study in the literature, this study provides an original contribution to the literature in terms of examining how the increase in oil prices affects the different sub-components of the current account balance over time. Thus, this study provides further empirical evidence on the implication of the neutrality effect of real oil price shocks on the current account balance in the long-term.

Empirical evidence gathered from Turkey reveals that, in the long run, balancing the current account is provided by a permanent increase in the net exports of Agricultural Production, Maintenance and Repair Services, Travel, Construction, Financial Services, Compensation of Employees, and Goods under Merchanting (non-tradable components of the current account balance); and a permanent decrease in the net exports of Mining, Fishery, Other Goods for BEC Classification, Investment Income, Manufacturing Services on Physical Inputs Owned by Others, and Transport balances mostly in sectors that use energy heavily in production. Overall, we may claim that the correction comes in service or non-tradable industries with current account surpluses in the long-term. However, for the sectors that use energy as input for a significant part of production processes, then a permanent deterioration is observed.

These information about the effects of crude oil prices on the sub-components of current account balance might be useful for policymakers as they design their economic policies across sectors; it could help speed up the adjustment in order to minimize the social loss, as well as prioritize the sub-sectors, which would support them in an adverse oil shock. Moreover, the government collects sizable tax revenues from oil products. Thus, a lower net export may mean higher tax revenue due to higher domestic consumption associated with a higher import bill. Thus, the government may adjust its tax policies on different oil products for the sub-components of different sub-sectors to stimulate the output of those sectors.

[7] The results of these analyses are not presented here to save space but are available from the authors upon request.

References

Agmon, T., Laffer, A.B., 1978. Trade, payments and adjustment: the case of the oil price rise. Kyklos 31, 68–85.
Aristovnik, A., 2007. Short- and Medium-Term Determinants of Current Account Balances in Middle East and North Africa Countries. William Davidson Institute Working Paper, No, p. 862.
Aytemiz, T., Şengönül, A., 2008. Regression tree analysis of effects of energy prices on Turkish current account deficit. İktisat, İşletme ve Finans 23 (269), 94–109.
Baffes, J., Kose, M.A., Ohnsorge, F., Stocker, M., 2015. The Great Plunge in Oil Prices: Causes, Consequences, and Policy Responses. https://doi.org/10.2139/ssrn.2624398.
Baharumshah, A.Z., Lau, E., Fountas, S., 2003. On the sustainability of current account deficits: evidence from four ASEAN countries. J. Asian Econ. 14, 465–487.
Bai, J., Ng, S., 2002. Determining the number of factors in approximate factor models. Econometrica 70 (1), 191–221.
Bayat, T., Şahbaz, A., Akçacı, T., 2013. Petrol fiyatlarının dış ticaret açığı üzerindeki etkisi: Türkiye örneği. Erciyes Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi 42, 67–90.
Bean, C.R., 1986. The terms of trade, labor supply and the current account. Econ. J. 96, 38–46.
Bernanke, B.S., Boivin, J., Eliasz, P., 2005. Measuring the effects of monetary policy: a factor-augmented vector autoregressive (FAVAR) approach. Q. J. Econ. 120 (1), 387–422.
Bitzis, G., Paleologos, J.M., Papazoglou, C., 2008. The determinants of the Greek current account deficit: the EMU experience. Journal of International and Global Economic Studies 1 (1), 105–122.
Cardi, O., 2007. Another view of the j-curve. Macroecon. Dyn. 11, 153–174.
Chuku, C.A., Akpan, U.F., Sam, N.R., Effiong, E.L., 2011. Oil price shocks and the dynamics of current account balances in Nigeria. OPEC Energy Review 35 (2), 119–139.
Cushman, D.O., Zha, T., 1997. Identifying monetary policy in a small open economy under flexible exchange rates. J. Monetary Econ. 39 (3), 433–448.
Demirbaş, M., Türkay, H., Türkoğlu, M., 2009. Petrol fiyatlarındaki gelişmelerin Türkiyenin cari açığı üzerine etkisinin analizi. Süleyman Demirel Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi 14 (3), 289–299.
Edwards, S., 1987. Tariffs, Terms of Trade, and the Real Exchange Rate in an Intertemporal Optimizing Model of the Current Account. NBER Working Paper, No. 2214.

Frenkel, J.A., Assaf, R., 1987. Fiscal Policies and the World Economy: an Intertemporal Approach. MIT Press, Cambridge, Massachusetts, 1987.
Greenwood, J., 1984. Non-traded goods, the trade balance, and the balance of payments. Can. J. Econ. 1984, 806–823.
Gruber, J.W., Kamin, S.B., 2007. Explaining the global pattern of current account imbalances. J. Int. Money Finance 26, 500–522.
Guidi, F., 2009. The Economic Effects of Oil Prices Shockson the UK Manufacturing and Servicessector *Munich Personal RePEc Archive*. Paper No. 16171.
Harberger, A.C., 1950. Currency depreciation, income, and the balance of trade. J. Polit. Econ. 58, 47–60.
Huang, K.X.D., Meng, Q., 2007. The Harberger-Laursen-Metzler effect under capital market imperfections. J. Int. Money Finance 26, 1001–1015.
Huntington, H.G., 2015. Crude oil trade and current account deficits. Energy Econ. 50, 70–79.
Kaminsky, G., Lizonda, S., Reinhart, C.M., 1998. Leading indicators of currency crises. Int. Monetary Fund Staff Pap. 45 (1), 1–48.
Kaminsky, G., Reinhart, C.M., 1999. The twin crises: the causes of banking and balance-of-payments problems. Am. Econ. Rev. 89 (3), 473–500.
Kayıkçı, F., 2012. Determinants of current account balance in Turkey: vector autoregression (VAR) approach. Afr. J. Bus. Manag. 6 (17), 5725–5736.
Kilian, L., 1998. Small-sample confidence intervals for impulse response functions. Rev. Econ. Stat. 80 (2), 218–230.
Kilian, L., Rebucci, A., Spatafora, N., 2009. Oil shocks and external balances. J. Int. Econ. 77 (2), 181–194.
Laursen, S., Metzler, L.A., 1950. Flexible exchange rates and the theory of employment. Rev. Econ. Stat. 32, 281–299.
Le, T.H., Chang, Y., 2013. Oil price shocks and trade imbalances. Energy Econ. 36, 78–96.
Marion, N.P., 1984. Nontraded goods, oil price increases and the current account. J. Int. Econ. 16, 29–44.
Matsuyama, K., 1988. Terms of trade, factor intensities and the current account in a life-cycle model. Rev. Econ. Stud. 55 (2), 247–262.
Narayan, S., 2013. A structural VAR model of the Fiji islands. Econ. Modell. 31, 238–244.
Obstfeld, M., 1980. Intermediate imports, the term of trade, and the dynamics of exchange rate, and current account. J. Int. Econ. 10, 461–480.
Obstfeld, M., 1982. Aggregate spending and the terms of trade: is there a Laursen-Metzler effect? Q. J. Econ. 97, 251–270.
Ostry, J.D., 1988. The balance of trade, terms of trade, and real exchange rate: an intertemporal optimizing framework. Int. Monetary Fund Staff Pap. 35 (4), 541–573.
Otto, G., 2003. Terms of trade shocks and the balance of trade: there is a Harberger-Laursen- Metzler effect. J. Int. Money Finance 22, 155–184.
Özata, E., 2014. Sustainability of current account deficit with high oil prices: evidence from Turkey. International Journal of Economic Sciences 3 (2), 71–88.
Özlale, Ü., Pekkurnaz, D., 2010. Oil prices and current account: a structural analysis for the Turkish economy. Energy Pol. 38 (8), 4489–4496.
Peker, O., Hotunluoğlu, H., 2009. Türkiye'de cari açığın nedenlerinin ekonometrik analizi. Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi 23 (3).
Persson, T., Svensson, L.E.O., 1985. Current account dynamics and the terms of trade: Harberger-laursen-metzler two generations later. J. Polit. Econ. 93, 43–65.
Rebucci, A., Spatafora, N., 2006. Oil prices and global imbalances. IMF World Economic Outlook 4, 71–96, 2006.
Sachs, J., 1981. The current account and macroeconomic adjustment in the 1970s. Brookings Pap. Econ. Activ. 1, 201–282.
Sachs, J.D., 1982. In: Bhandari, J., Putnam, B. (Eds.), Energy and Growth under Flexible Exchange Rates: A Simulation Study, the International Transmission of Economic Disturbances under Flexible Ex-Change Rates. M.I.T. Press, Cambridge, MA.
Schubert, S.F., 2014. Dynamic effects of oil price shocks and their impact on the current account. Macroecon. Dyn. 18 (2), 316–337.
Sen, P., Turnovsky, S.J., 1989. Deterioration of the terms of trade and capital accumulation: are-examination of the Laursen-Metzler effect. J. Int. Econ. 26, 227–250.
Soares, R., 2013. Assessing monetary policy in the Euro area: a factor-augmented VAR approach. Appl. Econ. 45 (19), 2724–2744.
Stock, J.H., Watson, M.W., 2005. Implications of dynamic factor models for VAR analysis. NBER Work. Pap. 11467, 1–65.
Svensson, L.E.O., Razin, A., 1983. The terms of trade and the current account: the Harberger-Laursen-Metzler effect. J. Polit. Econ. 91, 97–125.
Svensson, L.E.O., 1984. Oil prices, welfare, and the trade balance. Q. J. Econ. 99 (4), 649–672.
Turnovsky, S.J., Sen, P., 1991. Fiscal policy, capital accumulation, and debt in an open economy. Oxf. Econ. Pap. 43, 1–24.
Van Wijnbergen, S., 1985. Oil price shocks, unemployment, investment and the current account: an intertemporal disequilibrium analysis. Rev. Econ. Stud. 52 (4), 627–645.
Zaouali, S., 2007. Impact of higher oil prices on the Chinese economy. OPEC Energy Review 31 (3), 191–214.