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Excess stock returns, oil shocks, and policy uncertainty in the U.S.

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Abstract

This paper examines the dynamic relationships among the excess stock returns, oil shocks, and economic policy uncertainty in the United States (U.S). By using 11 different measures of policy uncertainty shocks, we find that excess stock returns to lead a significant policy uncertainty in general, and there are significant effects of the excess stock returns on all policy uncertainties–economic, monetary, and tax policies in particular. In addition, the results highlight that policy uncertainty in the U.S. is also driven by the oil price shocks in the long-run.

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1. Introduction

After the global financial crisis of 2008–09, financial economics literature focuses on the effects of uncertainty shocks. This relevance mainly comes from the theoretical models of Bloom (2009) and Pastor and Veronesi (2013) as well as the empirical findings in Jurado *et al.* (2015) and Baker *et al.* (2016). At this point, Baker *et al.* (2016) define several types of policy uncertainty shocks and introduce a new uncertainty measure that is known as the "Economic Policy Uncertainty (EPU)". Since the introduction of first version of the paper of Baker *et al.* (2016) in 2013, various studies have examined the effects of the EPU indexes on the real returns in financial markets; e.g., U.S. stock market returns (Antonakakis *et al.*, 2013; Arouri *et al.*, 2016; Broadstock and Filis, 2014; Gupta *et al.*, 2014; Kang and Ratti, 2013; Phan *et al.*, 2015); BRICS stock market returns (Kang and Ratti, 2015; Mensi *et al.*, 2014); stock market volatility (Liu and Zhang, 2015); commodity and oil market returns (Andreasson *et al.*, 2016; Chen *et al.*, 2014; Ciner, 2013, Li *et al.*, 2016; Reboredo and Uddin, 2016). At this point, Kang and Ratti (2013) examined the dynamic relationships among the news-based EPU, the oil shocks, and the U.S. stock market returns. They observed that the EPU has a significant negative effect on the real stock returns. There is also a positive relationship between the oil price and the stock returns; however, the real oil price leads to a higher EPU.

Following the empirical strategy of Kang and Ratti (2013), we examine the dynamic relationships among oil shocks, excess returns, and policy uncertainty measures in the U.S. Our paper provides two main contributions to the empirical literature. First, it is the first paper to examine the effects 11 different types of uncertainty shocks on the stock and oil markets in the literature. Second, our paper considers the excess returns in the U.S. stock market in the empirical literature with focusing on the sub-indexes of the EPU shocks. In this paper, we examine excess stock returns—not the stock market returns—that is commonly neglected by most of previous empirical papers (Bekiros *et al.*, 2016; Gupta *et al.*, 2014). Indeed, the excess returns of the stock market should be an important phenomenon since the negative real interest rate in developed economies, including the U.S., creates not only an uncertain environment in financial markets, but also motives investors and traders to invest in alternative markets for additional returns. This issue creates a significant volatility in commodity and oil markets, so known as the "financialization in commodity markets" in one hand (Gozgor *et al.*, 2016), and the significant equity premium in stock markets in other hand (Bekiros *et al.*, 2016; Gupta *et al.*, 2014). So, along with the uncertainty shocks, the excess stock market return is also a remarkable issue in the empirical literature after the great global recession of 2008–09. Our paper aims to shed light on these issues of the recent empirical literature. We find that excess stock returns to lead a significant policy uncertainty in general, and there are significant effects of excess stock returns on uncertainties in economic, monetary, and tax policies in particular. In addition, we observe that both oil price- and global aggregate demand shocks lead to a significant policy uncertainty in the U.S. economy. The results highlight that policy uncertainty in the U.S. is also driven by oil price shocks in the long-run.

The rest of the paper is organized as follows. Section 2 explains the data, the empirical model, and the econometric methodology. Section 3 discusses the empirical results. Section 4 concludes.

2. Data, Empirical Model, and Econometric Methodology

2.1. Data

The paper considers monthly data for the policy uncertainty indexes in the U.S., the excess returns in the U.S. stock markets, and oil markets for the period from January 1994 to June

2015. The choice of the sample is related to the data availability. Excess return is "the value-weighted market return of AMEX, NASDAQ, and NYSE stocks" minus one-month Treasury bill rate (risk free rate) ($r_m - r_f$). The excess stock return data are obtained from the data library of Kenneth French.[1] We also use the real excess stock return, which is adjusted by the consumer price index (CPI) (all urban consumers, 2005=100). The CPI data are obtained from the Bureau of Labor Statistics (BLS).

The world production of oil (total oil supply, thousand barrels per day), and the U.S. crude oil composite acquisition cost by refiners (dollars per barrel) are obtained from the U.S. Department of Energy.[2] Crude oil composite acquisition cost by refiners is also adjusted by the CPI. The index of global real economic activity is based on the "equal-weighted dry cargo freight rates" and the data are obtained from Kilian (2009).[3] The index of global real economic activity is expected to be positively related to both oil and stock market returns.

The index on the U.S. policy uncertainty (baseline overall index)[4] is composed by the weighted average of 10 uncertainty sources: i) economic policy uncertainty, ii) monetary policy uncertainty, iii) taxes policy uncertainty, iv) government spending policy uncertainty (fiscal policy uncertainty), v) health care policy uncertainty, vi) national security policy uncertainty, vii) entitlement programs policy uncertainty, viii) regulation policy uncertainty (financial regulation), ix) trade policy uncertainty, and x) sovereign debt, currency crisis uncertainty.[5] Intuitively, an aggregated EPU index includes areas that probably don't have a large direct impact on oil price. However, these variables are motivated by uncertainty theory of Baker *et al.* (2016) and Bloom (2009) and that's why we focus on the disaggregated EPU measures.

The index is initially constructed by Baker *et al.* (2016) and the data are obtained from the website of Baker *et al.* (2016). The news-based policy uncertainty data are based on media coverage of policy uncertainty and it is constructed by the month-by-month searches of Google News for articles containing the term uncertainty terms related to 10 policy measures, which are defined above.[6]

2.2. Empirical Model and Econometric Methodology

The paper uses the Structural Vector Autoregression (SVAR) model of Kilian (2009) and Kilian and Park (2009) to analyze the effects of three structural oil market shocks on the U.S. policy uncertainty and the excess stock returns. Oil is an important input of production; therefore, it can affect cash-flow of firms and it is related to the domestic output. A significant uncertainty about monetary, fiscal, trade, health, and national security policies can affect the firm's decision on production process and expectations for demand on products. Oil market shocks can also affect the inflation rate in the economy; therefore, the real interest rate (Hamilton, 2009). Change in the real interest rate and the policy uncertainty can also affect the investment decisions of firms. At this point, we develop the SVAR model of Kilian (2009) and

[1] For details see, http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html
[2] Following Kilian (2009) and Kang and Ratti (2013), "the percent change in the oil supply is 100 multiplied by the log difference of the world crude oil production in millions of barrels per day averaged monthly".
[3] See, http://www-personal.umich.edu/~lkilian/reaupdate.txt. In here, following the previous papers (e.g., Kang and Ratti, 2013), we use the global real economic activity and not a U.S. domestic measure, such as industrial production.
[4] See, http://www.policyuncertainty.com/us_monthly.html
[5] See, http://www.policyuncertainty.com/categorical_epu.html
[6] For details of the policy uncertainty measures see, http://www.policyuncertainty.com/us_monthly.html

Kilian and Park (2009) by adding several policy uncertainty measures. The structural definition of the VAR model of ρ in a five-variable system can be written as follows:

$$A_0 y_t = c_0 + \sum_{i=1}^{p} A_i y_{t-i} + \varepsilon_t \quad (1)$$

In Eq. (1), $y_t = (\Delta prod_t \; grea_t \; oilp_t \; uspu_t \; excsr)_t$ and it is a vector of endogenous variables.[7] A_0 is the 5 x 5 coefficient matrix, c_0 is the 5 x 1 vector of constant terms, A_i indicates the 5 x 5 autoregressive coefficient matrices and ε_t represents the 5 x 1 vector of structural error disturbances. In the SVAR model, supply shocks in the oil market are captured by changes in the global oil production ($\Delta prod_t$); global demand shocks for all industrial commodities are measured by the index of global real economic activity ($grea_t$); oil-market related demand shocks is measured by the real oil price ($oilp_t$), the index of policy uncertainty indexes in the U.S. are denoted by $uspu_t$, and the real excess stock returns in the U.S. are represented by $excsr_t$.[8]

Following King and Ratti (2013), we multiply the variables of Eq. (1) with A_0^{-1} (has a recursive structure) and obtain the reduced form VAR. The reduced form errors (e_t), which is the linear combination of structural errors (ε_t), can be written as follows:

$$e_t = \begin{bmatrix} e_t^{\Delta prod_t} \\ e_t^{grea_t} \\ e_t^{oilp_t} \\ e_t^{uspu_t} \\ e_t^{excsr_t} \end{bmatrix} = \begin{bmatrix} a_{11} & 0 & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & a_{55} \end{bmatrix} \begin{bmatrix} \varepsilon_t^{\Delta prod_t} \\ \varepsilon_t^{grea_t} \\ \varepsilon_t^{oilp_t} \\ \varepsilon_t^{uspu_t} \\ \varepsilon_t^{excsr_t} \end{bmatrix} \quad (2)$$

In Eq. (2), $\varepsilon_t^{\Delta prod_t}$ is the oil-supply shocks, $\varepsilon_t^{grea_t}$ is the real aggregate demand shocks, $\varepsilon_t^{oilp_t}$ is the oil price shocks, $\varepsilon_t^{uspu_t}$ denotes the policy uncertainty measures in the U.S., and $\varepsilon_t^{excsr_t}$ indicates the real excess stock return shocks in the U.S.

Finally, following Kang and Ratti (2013), the recursive-design wild bootstrapped standard errors of Goncalves and Kilian (2004) with 2,000 replications are used in the estimations of impulse-response functions (IRFs). The modified recursive-design bootstrap method is able to model asymptotic smoothing of autoregressive models. In our paper, the SVAR models are used to provide historical decompositions that measure the "cumulative contribution of each structural shock" to the evolution of each variable over time. In addition, we use the "forecast error variance decompositions" that quantify the "average contribution of a given structural shock" to the variability of the data.

3. Empirical Results

3.1. Results for the Variance Decomposition of Excess Stock Returns

The results for the forecast error variance decompositions (FEVDs) of the structural model for the excess returns are reported in Appendix Table I. The results for the overall policy

[7] Following Kilian (2009) and Kilian and Park (2009), we consider ρ =24 to model possible long-delayed impacts of oil price shocks on the U.S. economy.

[8] Following Sims *et al.* (1990), we identify that error terms are stationary and there is no serial correlation and heteroskedasticity in the error terms.

uncertainty index and all sub-indexes show that the effects of policy uncertainty shocks on the excess stock returns are not statistically significant at the 5% significance level.[9]

3.2. Results for the Variance Decomposition of Policy Uncertainty

The results for the FEVDs of the structural model for the policy uncertainty indexes are reported in Table 1. First, the results of the baseline (overall) policy index are reported and then the results of the sub-indexes of policy uncertainty shocks (economic, monetary, taxes, government spending, health care, national security, entitlement programs, financial regulation, trade policy, and sovereign debt-currency crisis, respectively) are reported in Table 1. Again, the absolute t-statistics, which are based on bootstrapped standard errors, are represented in parentheses.

Table 1: Forecast Error Variance Decomposition (FEVD) of the Policy Uncertainty in the U.S.

	Period	Oil supply shock	Aggregate demand shock	Oil-market specific demand shock	Excess return shocks	Other shocks
Baseline policy uncertainty	1	0.792704	0.573576	0.402014	6.545600	91.68611
		(1.22226)	(1.07547)	(0.88608)	(2.95235)	(3.31353)
	3	1.902143	0.338590	0.221792	12.46497	85.07250
		(2.13435)	(0.82612)	(0.59968)	(4.65099)	(4.87425)
	12	2.186874	0.341449	0.789759	13.35025	83.33166
		(2.36809)	(0.87110)	(0.79465)	(5.08495)	(5.35323)
	24	2.228125	0.637330	3.690934	12.90477	80.53884
		(2.35891)	(1.86411)	(2.42341)	(5.02032)	(5.70699)
	60	2.106159	0.701842	9.794165	12.10142	75.29642
		(2.21288)	(3.16637)	(5.34434)	(4.75644)	(6.85241)
Economic policy uncertainty	1	0.017877	0.032325	0.059209	12.05266	87.83793
		(0.51776)	(0.52981)	(0.47001)	(3.75066)	(3.78206)
	3	1.173067	0.030098	0.039841	23.64065	75.11634
		(1.59756)	(0.44526)	(0.35859)	(5.77196)	(5.78019)
	12	1.454280	0.495154	0.894155	25.30119	71.85522
		(1.83782)	(2.14215)	(1.25491)	(6.24530)	(6.48787)
	24	1.436472	0.660053	2.221979	24.93771	70.74378
		(1.79335)	(3.53167)	(2.71105)	(6.19996)	(6.91327)
	60	1.401064	0.902240	4.026666	24.56911	69.10091
		(1.73268)	(4.59012)	(4.83988)	(6.21104)	(7.89585)
Monetary policy uncertainty	1	4.38E-05	0.000222	0.008776	6.512955	93.47800
		(0.57238)	(0.48511)	(0.51723)	(2.99272)	(3.04929)
	3	0.025711	0.000279	0.007045	18.58437	81.38260
		(0.70908)	(0.47253)	(0.44409)	(5.31011)	(5.31145)
	12	0.034712	0.001424	0.055963	19.59086	80.31704
		(0.73156)	(1.37788)	(0.54367)	(5.53919)	(5.65107)
	24	0.034759	0.003808	0.109379	19.58503	80.26702
		(0.72560)	(2.35977)	(0.87402)	(5.50125)	(5.88109)
	60	0.034740	0.036635	0.176727	19.57454	80.17736
		(0.72089)	(4.31418)	(2.05425)	(5.46735)	(7.00682)

[9] Note that the critical values of the t-test is 1.96 at the 5% significance level and it is 2.58 at the 1% significance level.

Taxes uncertainty	1	0.212570	0.581558	0.335026	6.360331	92.51052
		(0.73649)	(1.02111)	(0.81057)	(2.98748)	(3.20969)
	3	0.643922	0.417012	0.188153	12.26974	86.48118
		(1.14163)	(0.89867)	(0.60716)	(4.69030)	(4.74999)
	12	0.785878	0.382259	1.176822	13.32282	84.33222
		(1.40619)	(1.90894)	(1.32887)	(5.15931)	(5.54085)
	24	0.777687	0.402330	3.366233	12.99598	82.45777
		(1.37352)	(3.38794)	(3.19537)	(5.00341)	(6.34255)
	60	0.743895	1.251252	6.539284	12.64626	78.81930
		(1.30782)	(5.38165)	(6.20186)	(4.79143)	(8.80300)
Government spending uncertainty	1	0.183268	0.376254	0.003700	1.876671	97.56011
		(0.73082)	(0.94999)	(0.52352)	(1.87067)	(2.25581)
	3	1.204235	0.272065	0.110129	2.735793	95.67778
		(1.47981)	(0.73351)	(0.53011)	(2.59158)	(3.06809)
	12	1.339686	2.387028	2.003699	2.746807	91.52278
		(1.63860)	(2.89881)	(1.59732)	(2.65729)	(4.53623)
	24	1.304706	3.262373	4.392961	2.665923	88.37404
		(1.58667)	(4.56813)	(3.23777)	(2.56084)	(6.20243)
	60	1.253096	3.547196	7.754871	2.693704	84.75113
		(1.51206)	(5.69529)	(6.40818)	(2.66526)	(9.37609)
Health care uncertainty	1	0.409575	0.993973	0.121043	2.659441	95.81597
		(0.90035)	(1.23787)	(0.67000)	(2.04038)	(2.53389)
	3	2.100942	0.696925	0.205637	4.397325	92.59917
		(1.78267)	(1.04040)	(0.54757)	(3.17274)	(3.76323)
	12	2.271222	1.082824	4.034348	4.319440	88.29217
		(1.94020)	(2.00721)	(2.16635)	(3.20188)	(4.62762)
	24	2.172247	1.107908	8.632710	4.157991	83.92914
		(1.83988)	(3.09889)	(4.26882)	(3.00723)	(6.03553)
	60	1.987139	3.022135	14.18545	4.108730	76.69655
		(1.67959)	(6.39233)	(7.88424)	(2.74277)	(10.2241)
National security uncertainty	1	0.115052	4.31E-05	0.418837	9.998543	89.46752
		(0.67016)	(0.53679)	(0.86261)	(3.49916)	(3.64227)
	3	0.097546	0.005156	0.384333	15.59615	83.91682
		(0.85371)	(0.54277)	(0.80228)	(5.21863)	(5.29986)
	12	0.081985	0.083295	0.365188	16.98264	82.48690
		(0.89967)	(1.89399)	(0.92655)	(5.75867)	(6.02625)
	24	0.081858	0.164809	0.364655	16.98616	82.40252
		(0.89037)	(3.51722)	(1.24058)	(5.69222)	(6.51183)
	60	0.081911	0.219835	0.364695	16.97752	82.35604
		(0.87771)	(6.62999)	(2.21239)	(5.65417)	(8.26618)
Entitlement programs uncertainty	1	0.033528	0.324994	0.060717	2.421804	97.15896
		(0.62522)	(0.83198)	(0.54252)	(2.10867)	(2.33645)
	3	0.549625	0.296815	0.079750	3.908160	95.16565
		(1.17901)	(0.62704)	(0.48960)	(3.15631)	(3.38925)
	12	0.632626	2.536778	1.286404	3.998380	91.54581
		(1.26779)	(2.99384)	(1.35317)	(3.22388)	(4.74690)

	24	0.629330	3.412421	2.825472	3.892402	89.24038
		(1.24247)	(4.91327)	(2.85093)	(3.11228)	(6.49763)
	60	0.615786	3.568545	5.173619	3.843042	86.79901
		(1.20002)	(6.96201)	(6.01706)	(2.97818)	(9.90032)
Financial regulation uncertainty	1	0.705832	0.088437	0.213835	2.038937	96.95296
		(1.16648)	(0.64269)	(0.81349)	(1.78351)	(2.27233)
	3	6.087299	0.111607	0.225589	6.023454	87.55205
		(3.36855)	(0.62576)	(0.58613)	(3.47851)	(4.71232)
	12	6.275840	0.276546	2.329849	6.082915	85.03485
		(3.42936)	(1.35889)	(1.48568)	(3.51787)	(5.02007)
	24	6.094226	0.759799	4.479698	6.055271	82.61101
		(3.32058)	(2.13078)	(2.68885)	(3.42802)	(5.42150)
	60	5.824522	2.328682	6.906868	6.038262	78.90167
		(3.16513)	(4.41669)	(4.64660)	(3.32942)	(7.24167)
Trade policy uncertainty	1	0.163955	0.064268	0.245275	0.767267	98.75924
		(0.75493)	(0.61585)	(0.77244)	(1.19603)	(1.70570)
	3	1.469676	0.045077	0.192086	3.236681	95.05648
		(1.55536)	(0.57493)	(0.58602)	(2.74453)	(3.13236)
	12	1.496759	0.187579	1.695305	3.712688	92.90767
		(1.61578)	(1.46407)	(1.32096)	(2.98024)	(3.73994)
	24	1.461875	0.716892	3.365442	3.719197	90.73659
		(1.56379)	(2.86956)	(2.54231)	(2.90516)	(4.77592)
	60	1.402873	2.563742	5.268662	3.724076	87.04065
		(1.48282)	(6.60080)	(4.73414)	(2.79370)	(8.53690)
Sovereign debt, currency crises uncertainty	1	0.094967	0.309325	0.115442	0.066663	99.41360
		(0.58183)	(0.86131)	(0.70143)	(0.66532)	(1.40076)
	3	0.075375	0.523856	0.103048	1.692570	97.60515
		(0.77576)	(1.06516)	(0.66548)	(2.20505)	(2.67426)
	12	0.085516	1.509261	0.095928	2.137587	96.17171
		(0.85948)	(3.08832)	(0.79289)	(2.63263)	(4.30439)
	24	0.087512	2.058121	0.127845	2.140888	95.58563
		(0.85112)	(5.03723)	(1.27661)	(2.61163)	(6.03780)
	60	0.088204	2.230538	0.210638	2.136879	95.33374
		(0.84144)	(7.60931)	(2.70505)	(2.58793)	(9.06279)

The results for the baseline policy uncertainty index indicate that the excess stock return leads to a significant policy uncertainty in the first month. Along with the excess stock return, oil supply shocks also lead to a policy uncertainty within three months. In addition, along with both the excess stock return and oil supply shocks, oil price shocks lead to a policy uncertainty in the midterm (24 months). Finally, along with the excess stock return, three types of oil market shocks (oil supply, oil price, aggregate global real demand) conduce policy uncertainty in the long-run (60 months) and the results are statistically significant. The results indicate that the oil supply shocks, the global real demand shocks, and the oil-market specific (oil price) explain 2.1%, 0.7%, and 9.8% of the variations in policy uncertainty, respectively. Therefore, the oil market shocks explain 12.6% of the variations in policy uncertainty in total. The results in Table 1 also indicate that the excess stock returns explain 12.1% variation of the policy uncertainty in the long-run and this result is also statistically significant at the 1% level.

The results of the sub-indexes of the policy uncertainty indicate that the excess return leads to a significant economic, monetary, national security, taxes, financial regulation, health care, entitlement programs, trade policy, government spending, and sovereign debt-currency crisis policy uncertainty shocks, respectively. These results are also statistically significant at the 1 % level. Moreover, it is also found that the effects of both aggregate global demand shocks and oil-market specific shocks on policy uncertainty are also statistically significant in the long-run (60 months). Therefore, the findings of the baseline policy uncertainty index are statistically and economically robust.

However, the oil supply shocks only cause to a statistically significant financial regulation uncertainty in the long-run. Therefore, the results of significant effects of the oil supply shocks on the policy uncertainty are only related to financial regulation. Therefore, the effects of oil supply shocks on the policy uncertainty are not statistically robust.

3.3. Results of Impulse-Response Functions

The results of the responses to one standard deviation of five structural shocks (global oil supply, global aggregate economic activity, oil price, baseline policy uncertainty, and excess stock returns) over 24 months are represented in Appendix Figure 1. Following Kang and Ratti (2013), the recursive-design wild bootstrapped standard errors of Goncalves and Kilian (2004) with 2,000 replications are also used in the estimations of the IRFs.

The first row illustrates the results of the responses of the excess return shocks to structural innovations in excess stock return, oil supply, aggregate global demand, oil price, and policy uncertainty. It is observed that the excess stock returns do not respond the oil-market shocks, and the effects of policy uncertainty shocks are not persistent.

The second row represents the results of oil production (supply) to five structural innovations. Again, it is observed that oil production does not respond the excess stock return and the effects of oil price, global real aggregate demand, and policy uncertainty shocks are not found as persistent.

The third row illustrates the results of real global economic activity to five structural innovations. The results indicate that the excess stock return positively affects the real global economic activity, but its effect is gradually declining. Oil production has a persistent, but a small effect on the real global economic activity. Interestingly, oil price shocks have a slight, but suppressing effect on the real global economic activity. As expected, policy uncertainty shocks have a significant and a negative effect on the real global economic activity, but its effect is transitory in the long-run.

The fourth row represents the results of the real oil price to five structural innovations. Excess stock return has a positive and persistent effect on the real oil price. Oil production suppresses the oil price within 10 months, but the effect is not persistent. As expected, real global economic activity has a positive and persistent effect on the real oil price. Policy uncertainty also has a suppressing effect on the real oil price and the impact of the baseline policy uncertainty upon oil price is found as persistent. In short, the IRFs indicate that the real oil price is mainly driven by the global economic activity and somehow the excess stock return and policy uncertainty have contrary effects upon the oil price.

Finally, the fifth row illustrates the baseline policy uncertainty to five structural innovations and it is found that both the excess stock return and the oil production decrease the level of

policy uncertainty within three months. However, their effects are observed as temporary. Aggregate global demand shocks also reduce the policy uncertainty within four months, but its effect is not persistent. In addition, the real oil price shock hikes policy uncertainty, and the effect is found as significant over the long-run. In short, the results highlight that policy uncertainty in the U.S. is mainly driven by the oil price shocks in the long-run.

Some of the variables (like health care) mattered more after either new policy initiatives (like Obamacare). At this stage, we also consider sub-periods to capture time-variation across the sample. Our results show that "policy uncertainty in the US is driven by oil price shocks in the global markets" and this is true for both the full sample and sub-samples.[10] In addition, the degree of the U.S. depends on the imported oil–and therefore its sensitivity to policy effects– may also be changed considerably over the sample period investigated. Our findings can be related to the consequences of factors such as the effects of green energy, technology improvements and external supply-side shocks.

4. Conclusion

In this paper, we examined the dynamic relationships among the excess stock returns, oil shocks, and policy uncertainty in the U.S. For this purpose, we considered 11 different measures of policy uncertainty shocks. In this paper, we observed that excess stock returns to lead a significant economic policy uncertainty in general, and economic, monetary and tax policies in particular. In the long-run, the excess stock returns and oil market shocks explain 12.1% and 12.6% variation of the policy uncertainty, respectively. In addition, we found that oil price- and global aggregate demand shocks cause to a significant policy uncertainty in the U.S. economy. The results of the IRFs also indicated that policy uncertainty in the U.S. is driven by oil price shocks in the global markets. Indeed, increasing economic policy uncertainty in the U.S. in early 2010s may have harmed macroeconomic performance and our results show that macroeconomic implications of uncertainty associate with the oil markets.

Future papers can focus on the effects of the policy uncertainty indexes on the stock returns of emerging markets. In addition, other developed stock markets can be analyzed if the components of policy uncertainty are available in the future. Plus, the effects of policy uncertainty indexes on the real returns on other global commodity markets can also be considered. Future papers can also take into consideration the possibility of structural change in the model. Since uncertainty may affect the probability of regime shift, once can use the endogenous regime switching model to analyze the related issues.

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[10] We did not provide the results for the sub-periods in order to save space.

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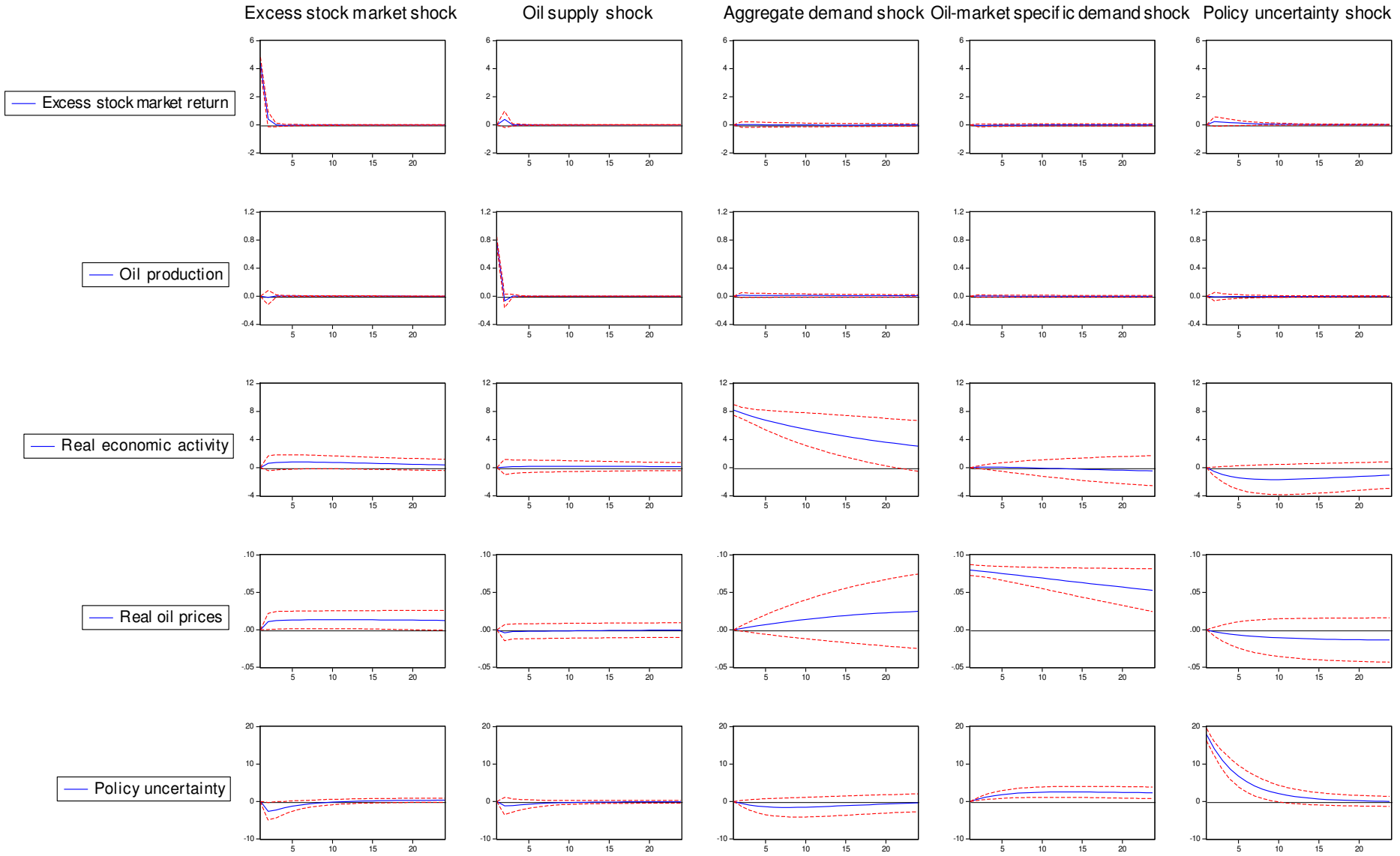
Appendix Figure 1: Responses to One-standard Deviation Structural Shocks in the U.S. (January 1994–June 2015)



Appendix Table I
Forecast Error Variance Decomposition (FEVD) of the Excess Stock Returns in the U.S.

	Period	Oil supply shock	Aggregate demand shock	Oil-market specific demand shock	Policy uncertainty shocks	Other shocks
Baseline policy uncertainty	1	0.000000	0.000000	0.000000	0.000000	100.0000
		(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
	3	0.672890	0.003802	0.030992	0.427129	98.86519
		(1.14319)	(0.12547)	(0.06754)	(0.66430)	(1.33042)
	12	0.680180	0.008815	0.055891	0.718001	98.53711
		(1.13867)	(0.38591)	(0.16147)	(1.07233)	(1.63186)
	24	0.680374	0.021336	0.057387	0.725289	98.51561
		(1.13646)	(0.55448)	(0.23784)	(1.07718)	(1.69700)
	60	0.680385	0.031168	0.057635	0.726575	98.50424
		(1.13323)	(0.82951)	(0.49738)	(1.07420)	(1.89117)
Economic policy uncertainty	1	0.000000	0.000000	0.000000	0.000000	100.0000
		(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
	3	0.716833	0.001582	0.011312	0.810231	98.46004
		(1.16072)	(0.11752)	(0.04481)	(0.88944)	(1.47151)
	12	0.725610	0.004428	0.019282	1.190973	98.05971
		(1.15767)	(0.38880)	(0.12586)	(1.21978)	(1.73526)
	24	0.725644	0.010350	0.020138	1.193657	98.05021
		(1.15514)	(0.55761)	(0.20194)	(1.21658)	(1.79751)
	60	0.725619	0.015361	0.020599	1.193978	98.04444
		(1.15171)	(0.89938)	(0.42874)	(1.21793)	(2.04633)
Monetary policy uncertainty	1	0.000000	0.000000	0.000000	0.000000	100.0000
		(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
	3	0.687499	0.006879	0.000460	0.213081	99.09208
		(1.11151)	(0.11922)	(0.02322)	(0.71711)	(1.33128)
	12	0.687105	0.024923	0.003599	0.239821	99.04455
		(1.10736)	(0.47951)	(0.10104)	(0.78600)	(1.42756)

	24	0.686986	0.038854	0.006104	0.240455	99.02760
		(1.10508)	(0.74410)	(0.17907)	(0.78338)	(1.53727)
	60	0.686873	0.052328	0.008341	0.241012	99.01145
		(1.10160)	(1.25832)	(0.40967)	(0.78358)	(1.96064)
Taxes uncertainty	1	0.000000	0.000000	0.000000	0.000000	100.0000
		(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
	3	0.736439	0.009141	0.028746	0.828147	98.39753
		(1.21304)	(0.14792)	(0.07074)	(0.91441)	(1.53181)
	12	0.737390	0.012773	0.053072	1.369449	97.82732
		(1.20342)	(0.47317)	(0.19308)	(1.45373)	(1.96548)
	24	0.737376	0.018642	0.055283	1.379109	97.80959
		(1.20012)	(0.68326)	(0.29123)	(1.46099)	(2.07121)
	60	0.737330	0.024991	0.056317	1.379921	97.80144
		(1.19472)	(1.14157)	(0.61472)	(1.46683)	(2.47399)
Government spending uncertainty	1	0.000000	0.000000	0.000000	0.000000	100.0000
		(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
	3	0.646783	0.004701	0.010803	0.810579	98.52714
		(1.12813)	(0.12079)	(0.04604)	(1.04140)	(1.52201)
	12	0.650769	0.022538	0.018481	1.081298	98.22691
		(1.12194)	(0.40770)	(0.13410)	(1.35594)	(1.80617)
	24	0.650672	0.049548	0.020005	1.081913	98.19786
		(1.11941)	(0.63811)	(0.22096)	(1.35372)	(1.89629)
	60	0.650578	0.070948	0.020819	1.081915	98.17574
		(1.11554)	(1.05935)	(0.42792)	(1.34803)	(2.15777)
Health care uncertainty	1	0.000000	0.000000	0.000000	0.000000	100.0000
		(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
	3	0.670322	0.026357	0.049313	1.709122	97.54489
		(1.13928)	(0.15670)	(0.08656)	(1.42734)	(1.87209)
	12	0.687090	0.039885	0.067023	2.198765	97.00724
		(1.13378)	(0.42904)	(0.17486)	(1.82793)	(2.25401)

	24	0.687073	0.060976	0.067536	2.199709	96.98471
		(1.13127)	(0.63753)	(0.25306)	(1.82486)	(2.31163)
	60	0.687038	0.075215	0.067627	2.199870	96.97025
		(1.12754)	(1.27190)	(0.47542)	(1.82043)	(2.65777)
National security uncertainty	1	0.000000	0.000000	0.000000	0.000000	100.0000
		(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
	3	0.695455	0.005105	0.002239	0.766408	98.53079
		(1.20515)	(0.11042)	(0.03217)	(0.89911)	(1.51702)
	12	0.691519	0.025129	0.002929	1.200993	98.07943
		(1.19290)	(0.42884)	(0.10837)	(1.36245)	(1.85380)
	24	0.691387	0.041028	0.003237	1.203810	98.06054
		(1.19014)	(0.69350)	(0.17929)	(1.36110)	(1.92326)
	60	0.691323	0.052370	0.003431	1.203673	98.04920
		(1.18611)	(1.59677)	(0.34927)	(1.36097)	(2.50327)
Entitlement programs uncertainty	1	0.000000	0.000000	0.000000	0.000000	100.0000
		(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
	3	0.643699	0.009297	0.014470	1.096286	98.23625
		(1.12128)	(0.13430)	(0.05014)	(1.26184)	(1.78002)
	12	0.644835	0.023188	0.023301	1.335527	97.97315
		(1.11487)	(0.41099)	(0.14406)	(1.52476)	(2.05261)
	24	0.644735	0.043109	0.025980	1.336265	97.94991
		(1.11185)	(0.64325)	(0.24208)	(1.52151)	(2.13732)
	60	0.644643	0.061184	0.028089	1.336748	97.92934
		(1.10732)	(1.21773)	(0.49406)	(1.51839)	(2.52253)
Financial regulation uncertainty	1	0.000000	0.000000	0.000000	0.000000	100.0000
		(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
	3	0.704337	0.014266	0.000961	0.294477	98.98596
		(1.14969)	(0.12430)	(0.03776)	(0.64859)	(1.36774)
	12	0.710426	0.045940	0.005190	0.321381	98.91706
		(1.15034)	(0.48370)	(0.13267)	(0.74597)	(1.53455)

	24	0.710666	0.067036	0.009657	0.325098	98.88754
		(1.14828)	(0.69999)	(0.24302)	(0.75045)	(1.66217)
	60	0.710868	0.084106	0.013405	0.328184	98.86344
		(1.14590)	(1.00746)	(0.50476)	(0.76167)	(1.97502)
Trade policy uncertainty	1	0.000000	0.000000	0.000000	0.000000	100.0000
		(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
	3	0.662212	0.005310	0.001374	0.359038	98.97207
		(1.16202)	(0.11422)	(0.03390)	(0.84726)	(1.47523)
	12	0.663465	0.027188	0.003743	0.428816	98.87679
		(1.15645)	(0.47380)	(0.12831)	(1.00681)	(1.65815)
	24	0.663337	0.045569	0.006948	0.428728	98.85542
		(1.15315)	(0.73496)	(0.25344)	(1.00420)	(1.76633)
	60	0.663214	0.063726	0.009893	0.428645	98.83452
		(1.14799)	(1.17188)	(0.76080)	(0.99970)	(2.18891)
Sovereign debt, currency crises uncertainty	1	0.000000	0.000000	0.000000	0.000000	100.0000
		(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
	3	0.647086	0.003010	0.002829	0.212399	99.13468
		(1.19023)	(0.10057)	(0.03395)	(0.66034)	(1.36732)
	12	0.646292	0.012624	0.008999	0.325737	99.00635
		(1.18478)	(0.39946)	(0.15046)	(0.98000)	(1.61226)
	24	0.646203	0.021396	0.012835	0.328658	98.99091
		(1.18246)	(0.62297)	(0.26538)	(0.98723)	(1.72353)
	60	0.646114	0.030992	0.016819	0.330494	98.97558
		(1.17872)	(1.19136)	(0.49124)	(1.00655)	(2.16793)