BBVA | RESEARCH

Economic Watch

United States

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Economic Analysis

US
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Uncertainty: Models and Impacts

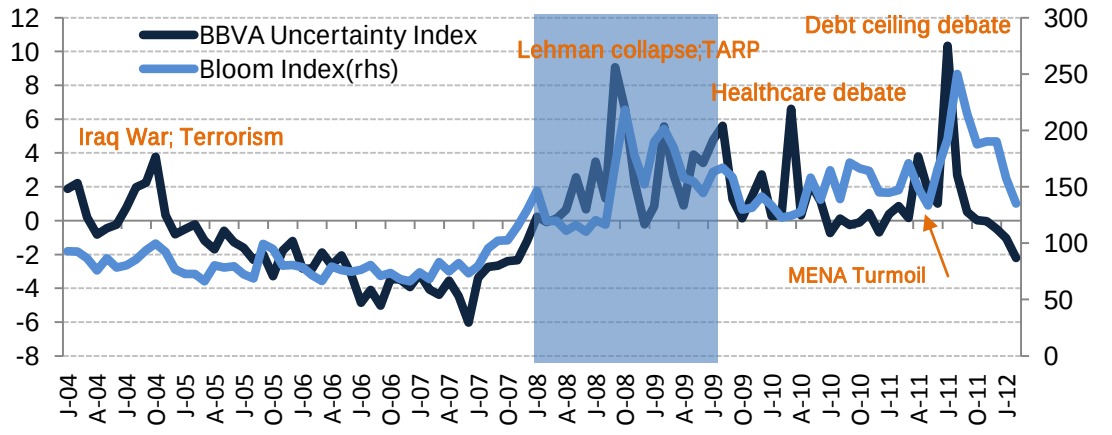
Efficiency enhancers allow for near-real time uncertainty modeling

- Asymmetric uncertainty shock possible cause of "weak recovery"
- Downside risks to uncertainty can be attenuated if they occur with financial crisis, policy uncertainty, or geopolitical uncertainty
- Search volume indexing is next iteration of uncertainty modeling

The abstraction of uncertainty is broad and like most unobservable phenomenon its quantification equally mutable. Uncertainty, while difficult to quantify, has vast and real manifestations and most often imparts an asymmetric influence on business cycles. In its most extreme realizations, uncertainty can severely dislocate efficient markets (e.g. labor, capital investment, and real estate). Thus, the combination of economic contraction and uncertainty can impart a moderating influence on a cyclical rebound. Specific examples include hysteretic employment and investment, high risk aversion in equity markets, household savings and decreased consumer lending, or oil price shocks. The most recent realization of hysteresis, as a result of the uncertainty overhang, was severe and persistent unemployment. Converse to certain *a priori* notions, non-residential fixed investment was robust during period. Thus, it appears uncertainty can have heterogeneous effects across markets. Given that uncertainty is an unavoidable phenomenon and its impacts varied, it is important to understand its empirical influence.

Following the Lehman Brothers collapse in 2008, our uncertainty index has remained above the mean deviation (zero). The high and persistent level of uncertainty is arguably an aggravating factor to the anemic recovery and hysteretic unemployment. This could be unique to this crisis given that the current recession was accompanied by a financial crisis. Nevertheless, it is clear that return to less than uncertain times coincides

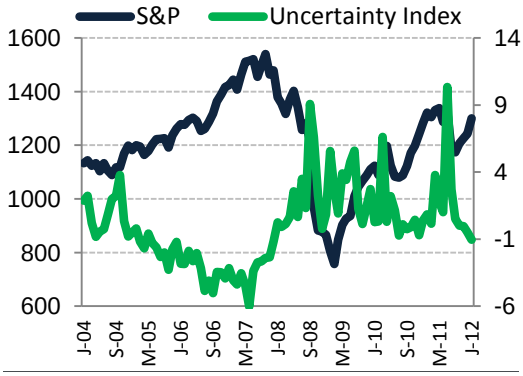
Chart 1
BBVA Uncertainty Index and Bloom Policy Uncertainty Index(recession=shaded)



Source: BBVA Research, Goggle Insights, & Haver

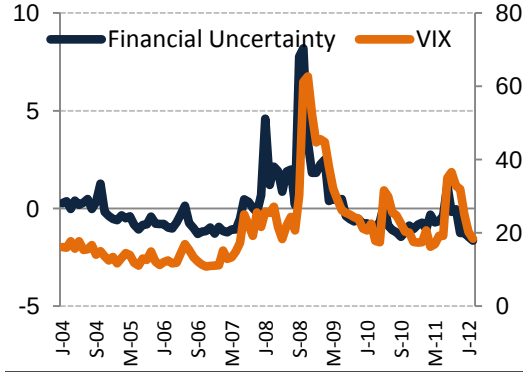
with improved equity markets, real economic outcome, and future expectations, in the current period. Thus, it appears that if the uncertainty shock is significant, markets will not reallocate efficiently until market perceive uncertainty as completely normalized (below average). As a pure data exercise, this phenomenon can be seen by the index crossing the zero threshold in January 2008, and not re-crossing the mean threshold until 4Q11. Specifically, equity market returns and volatility improved as uncertainty renormalized. On the debt ceiling fiasco and European sovereign debt in the 2Q11 and 3Q11, our index shows that market uncertainty was attenuating in 2010. However it appears the uncertainty generated by both situations reignited markets skepticism about the future, possibly prolonging the economic malaise.

Chart 2
Uncertainty Index v. S&P 500(Index Mean=0)



Source: BBVA Research & Google Insights

Chart 3
BBVA Financial Index vs. VIX(Index Mean=0)

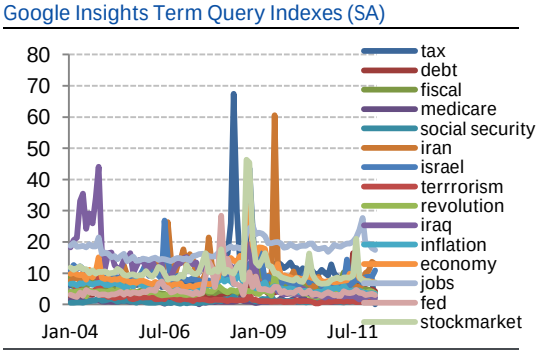


Source: BBVA Research, Goggle Insights, & Haver

In response to the uncertainty overhang, the Fed has adjusted their communication strategy to allow markets to facilitate informed household decision making and reduce financial and economic uncertainty. Furthermore, in response to possible hysteresis—uncertainty effect— in labor markets and misallocation in credit markets the Fed has maintained a historically low rates and used non-traditional monetary policy tools—e.g. large scale asset purchases or balance sheet sterilization— in order to minimize uncertainty or at the very least buoy household and firms expectations. Fiscal policy has also focused on reigniting household expectations through a series of stimulus packages both at the firm level (e.g. manufacturing subsidies) and the consumer level (e.g. payroll tax reduction). Nonetheless, the push to win the 2012 presidential election has deterred policy action and fueled rather than eased uncertainty in 3Q11. Therefore, given the likelihood of enduring uncertainty, we believe it is necessary to develop a metric that provides more transparency to markets and is quantifiable (ideally cardinal and that is efficiently managed). To achieve this end, we exploit the search query indexes of Google Insights that show the returns for specific words in a given category to model uncertainty.

The intuition is as follows: if the index returns from searches for taxes or economy are higher, it could be argued that this is a reflection of individuals' (or the market's) appetite for more knowledge. Conversely, if there is a reduction in the number of searches for taxes, fiscal, or debt, it is likely a reflection of less uncertainty regarding the issue. Therefore, an extreme movement in one search term index taken at the national (aggregate) level could provide a proxy for uncertainty about a specific event. Moreover, if words are carefully chosen to reflect different types of uncertainty, the results should provide a measure of a unique form of uncertainty. Similar intuition has been applied to automotive sales and results

Chart 4
Google Insights Term Query Indexes (SA)

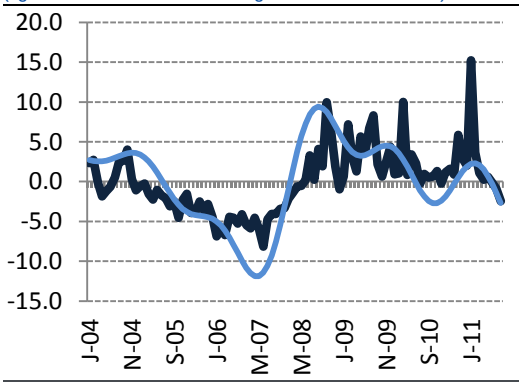


Source: BBVA Research & Google Insights

showed that movements in search volume coincided with increases and decreases in automotive sales (Varian and Choi 2009). Furthermore, the Google Trends (Insights) based methodology has been applied to tourist activities in Spain (link to article)

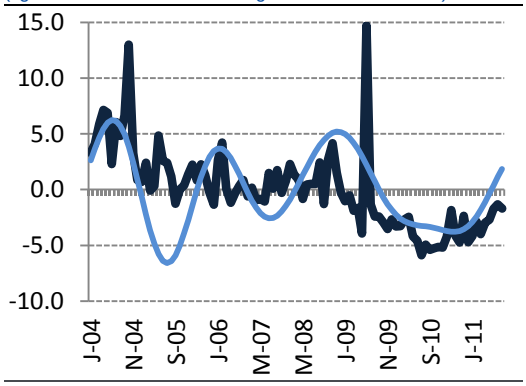
On conditioning, we believe it is advantageous to disaggregate uncertainty into unique indexes (geopolitical, policy, financial/economic) and then recombine each uncertainty index into on unified and transparent uncertainty metric able to discern oil price shocks due to heightened geopolitical risk from financial or domestic policy uncertainty. Current research uses similar methodology and mirrors some of the same fundamentals as our model, yet chooses differing ways to specify uncertainty and does not disaggregate uncertainty. In Bloom (2009), uncertainty is calculated using a combined and extrapolated volatility index using both realized and implied market volatility since 1895 to proxy for uncertainty. This approach also focused on the impact that second moment shocks have on investment and employment. Bloom's results showed that uncertainty can have persistent negative effects on both investment and employment. Most recently Baker et al (2012) focused on policy uncertainty. The authors created various uncertainty indices using word queries from public news databases for stories that included uncertainty, conditional on also containing "economic" or "economy." This brief, to improve the models robustness, also included discounted expiring tax policies and forecaster disagreement over future outcomes to compose a weighted uncertainty index. Other research used the aforementioned word query methodology for modeling uncertainty but focused on households' response to uncertainty (Knotek and Khan 2011). Their results, however, showed that there was no statistically significant response of households to uncertainty. On balance, the research to date is limited and therefore to better understand uncertainty and model it on a near real-time basis we apply statistical techniques to distill the high noise-to-information ratio.

Chart 5
Policy Uncertainty Index
(light blue = Christiano and Fitzgerald Band-Pass Filter)



Source: BBVA Research & Google Insights

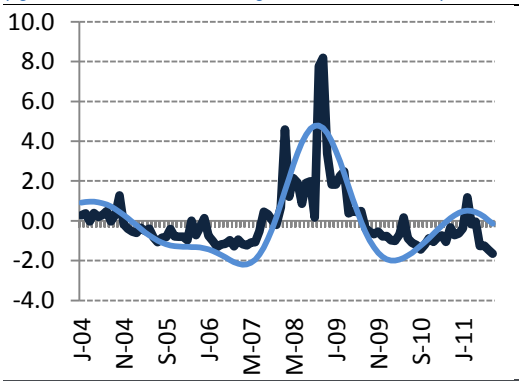
Chart 6
Geopolitical Uncertainty Index
(light blue = Christiano and Fitzgerald Band-Pass Filter)



Source: BBVA Research & Google Insights

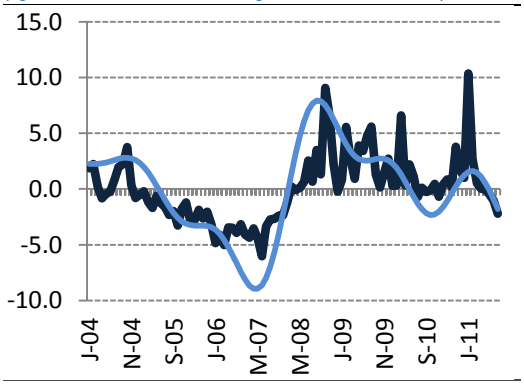
The proliferation of search volume data and its increasing availability allows us to exploit a more readily-available data source. Our lexeme based model, simplifies 15 searches terms such as taxes, debt, terrorism, and economy into three distinct uncertainty indexes and one aggregate index. After properly conditioning each search term index, terms are combined to form 3 indexes (geopolitical, policy, economic/financial) composed of 5 search terms per index (15 search terms). Chart 2 shows the 15 word search indexes uniformly scaled. It should be immediately apparent that in its raw form, the data is effectively uninformative. In addition, the information can be highly seasonal and thus we apply an X11 filter to adjust for seasonal movements. Lastly, given the cacophony of information, we use a principal component specification to distill the 15 word searches into the aforementioned uncertainty categories

Chart 7
Financial Uncertainty Index
(light blue = Christiano and Fitzgerald Band-Pass Filter)



Source: BBVA Research & Google Insights

Chart 8
Weighted BBVA Uncertainty Index
(light blue = Christiano and Fitzgerald Band-Pass Filter)



Source: BBVA Research & Google Insights

Inaccurate search index returns arise due to nearly limitless word combinations, and numerous word conjugations. In addition, a portion of specific terms are associated with spuriously correlated searches. However, our specification is at the national level and uses news-based searches, which should partially correct for these deficiencies, abating specious or wrongly specified searches. On conditioning, Google Insights adds two key controls. One, it returns top searches for a given term history, and thus provides a control for spurious query index returns. For example, when searching for taxes, a large percentage of the queries that are returned relate to tax preparation software or income tax returns. Given that we are indifferent to the amount of people searching for when they are going to receive their tax return or who they are going to use to file, the second function allows for conditional searches. In doing so we can remove searches for "turbo" or "return" in addition to adding phrases like "expiring", thus reducing spurious correlation. This transparency and added conditionality should improve the models representation of uncertainty.

Table 1
Twelve-month impulse response to a one unit uncertainty shock

Step	GDP Growth*	30-yr Treasury*	Industrial Production	Employment(K)	Unemployment Rate*	S&P 500**	VIX**	Investment***	Corporate Profits***	Inflation Expectations *
1	-0.03	0.02	-0.01	-33	0.02	-17.7	1.8	-2.8	1.1	-0.001
2	-0.06	-0.03	-0.20	-139	0.07	-27.8	2.2	-5.9	2.5	-0.003
3	-0.10	-0.06	-0.31	-206	0.10	-34.7	2.4	-9.2	4.3	-0.004
4	-0.14	-0.08	-0.39	-260	0.12	-38.0	2.3	-12.4	6.2	-0.005
5	-0.17	-0.09	-0.44	-300	0.14	-39.1	2.2	-15.4	8.2	-0.006
6	-0.21	-0.10	-0.48	-329	0.15	-38.8	2.0	-18.1	10.2	-0.006
7	-0.23	-0.11	-0.50	-349	0.16	-37.7	1.8	-20.4	12.0	-0.006
8	-0.25	-0.11	-0.52	-362	0.16	-35.9	1.6	-22.3	13.6	-0.006
9	-0.27	-0.12	-0.52	-369	0.17	-34.0	1.5	-23.8	15.1	-0.005
10	-0.28	-0.12	-0.52	-372	0.17	-31.8	1.3	-25.0	16.4	-0.005
11	-0.28	-0.12	-0.51	-371	0.17	-29.7	1.2	-25.8	17.5	-0.004
12	-0.27	-0.11	-0.50	-367	0.17	-27.6	1.0	-26.2	18.4	-0.003

Source: BBVA Research
* Percentage Point change
**Index Point Change
***Change in Billions $

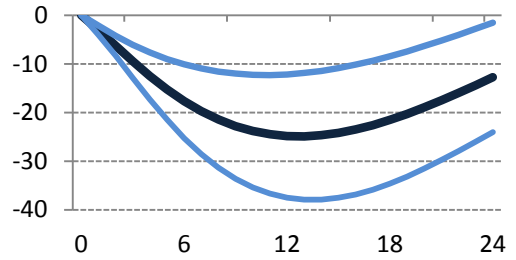
To test the model's accuracy and weighting, we verify that strong movements in a given index coincide with historical "uncertainty" events. Of note, the geopolitical index showed elevated levels in the early period when the Iraq war was progressing and terrorism uncertainty was at its height, in 2008 during the Iranian presidential elections, and recently during the Middle Eastern and North African (MENA) turmoil. The policy uncertainty index jumped in 2008 as the

government unveiled its bailout plan, and even more so in the most recent debt ceiling and deficit debate. The financial index also showed strong movements in 2008 as markets prepared for the largest bankruptcy in US history, bailout of the US auto industry, and possible of credit freeze. Given that the VIX is an accepted proxy for uncertainty, it is also important to check if market volatility movements reflect those of our financial index. On average, the financial uncertainty index appears to be a consistent with the VIX (Correlation: 63%) but the non-unity correlation suggests there could be important information within our index not accounted for in the VIX. Moreover, the strong movement in our index in 2008, prior to that of the VIX, suggests that our financial index could predate financial uncertainty events or more simply, could add another dimension to financial risk assessment. The recent turmoil between Iran and the US is also reflected in the elevated levels of our uncertainty index. The coordinated economic sanctions levied against Iran have influenced oil prices in the short-run, which could have an indirect effect on growth.

Outside of pure uncertainty modeling, it is important to understand how uncertainty influences markets. To do this we run a recursive vector autoregressive equation for various economic and financial indicators such as the S&P 500, Fed funds, yield on 30-year treasuries, investment, employment, and inflation expectations with our aggregate uncertainty measure. To understand the impact of uncertainty on each variable we produce orthogonalized impulse response functions which map the response of the aforementioned variables to a shock to uncertainty. Most results are consistent with *a priori* intuition. For example, as seen in Table 1, a one unit shock to uncertainty—a statistically significant jump in uncertainty— will decrease employment by 33K jobs in the month following the increase. Moreover, once the uncertainty disrupts markets, its impacts are hysteretic.

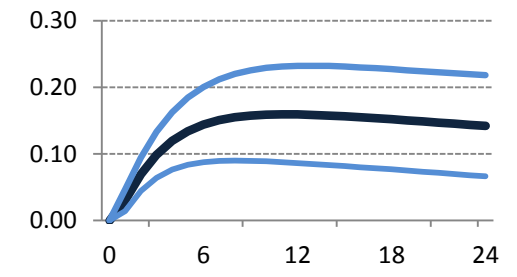
Impulse Response Graphics

Chart 9`
Investment
(light blue= 95% Confidence Interval)



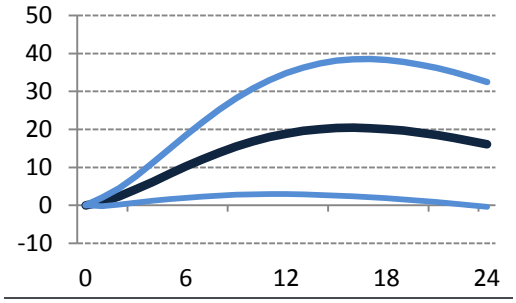
Source: BBVA Research & Google Insights

Chart 10
Unemployment Rate
(light blue= 95% Confidence Interval)



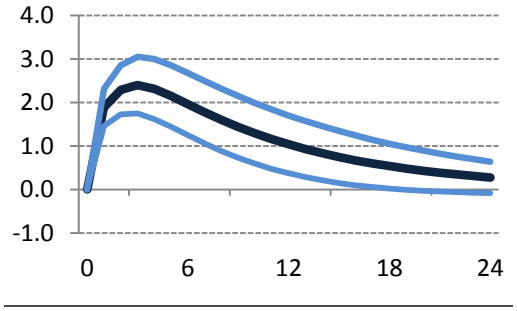
Source: BBVA Research & Google Insights

Chart 11
Corporate Profits
(light blue= 95% Confidence Interval)



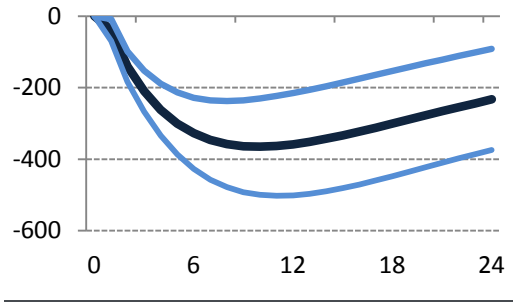
Source: BBVA Research & Google Insights

Chart 12
VIX
(light blue= 95% Confidence Interval)



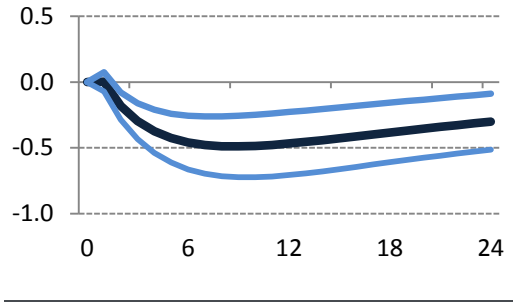
Source: BBVA Research & Google Insights

Chart 13
Employment
(light blue= 95% Confidence Interval)



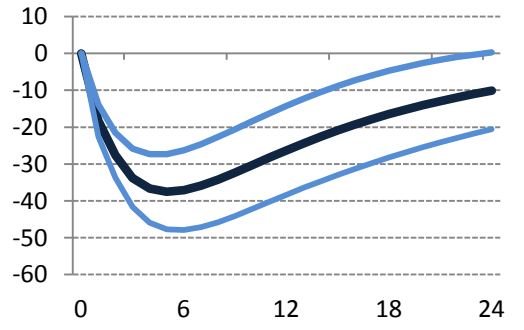
Source: BBVA Research & Google Insights

Chart 14
Industrial Production
(light blue= 95% Confidence Interval)



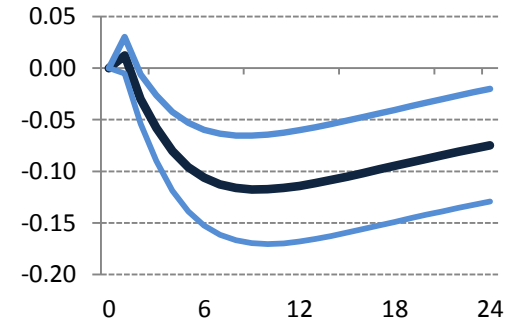
Source: BBVA Research & Google Insights

Chart 15
S&P 500 (light blue= 95% Confidence Interval)



Source: BBVA Research & Google Insights

Chart 16
30-yr Treasury (light blue= 95% Confidence Interval)



Source: BBVA Research & Google Insights

Investment also experiences similar declines, which reflects that idea that firms are unable to properly discount risk when uncertainty is high and therefore choose to forgo investing. Equity prices and interest rate yields show a decline in the 12 periods after an uncertainty shock. This reflects how individuals tend to shift their portfolio holding away from riskier assets into low-risk Treasuries.

Bottom Line

Uncertainty is unavoidable as all decisions incorporate varying degrees of risk—quantified metric uncertainty of future outcomes. Disaggregating uncertainty from Internet search queries is an innovation in that it allows a new approach to model and evaluate economic activity. By developing a more efficient uncertainty metric, our approach provides greater transparency and control for assessing uncertainty and could be extended to other variables. Qualitative checks against our uncertainty index are supported by historic uncertainty increases. Currently, levels of uncertainty are subsiding and the overhang of the past 4-year will not deter growth. However, risks are to the downside given that regulatory and fiscal policies could swing abruptly depending on the outcome of the presidential shape (2012 Presidential Vote-Share Model). In addition, austerity measures in Europe will likely progress, the fate of Greece is still vague, and escalating tensions with Iran will keep oil markets under pressure.

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References

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