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T. Randolph Beard, Hyeongwoo Kim, and Michael L. Stern

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T. Randolph Beard* Hyeongwoo Kim† Michael L. Stern‡

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Abstract

We study the dynamic relationship between Mr. Trump's prospects and the US dollar-peso exchange rate, controlling for other factors that determine the overall US dollar exchange rates. Increases in Mr. Trump's probability of winning generate short-run but statistically significant and economically meaningful disturbances in the US dollar-peso exchange rate.

JEL Classification: Donald Trump; PredictIt; Peso; Vector Autoregression

Keywords: F31; G15

*Department of Economics, Auburn University, AL 36849, USA. Tel: 1-334-844-2918. Fax: 1-334-844-4615. Email: beardtr@auburn.edu.

†Department of Economics, Auburn University, AL 36849, USA. Tel: 1-334-844-2928. Fax: 1-334-844-4615. Email: gmmkim@gmail.com.

‡Department of Economics, Auburn University, AL 36849, USA. Tel: 1-334-844-2982. Fax: 1-334-844-4615. Email: sternml@auburn.edu.

1 Introduction

Donald Trump's campaign for the US presidency has stirred tremendous discussion in the US and abroad, and several of his policy proposals have been exceptionally controversial. Foremost among these, perhaps, is his pledge to construct a wall along the southern border, to be paid for by Mexico, in order to keep illegal Mexican immigrants from entering the United States. Furthermore, Mr. Trump has been highly critical of the US trade deficit with Mexico and has promised to renegotiate trade deals such as NAFTA. This position is understandably interpreted as highly unfavorable to Mexico, a country with extensive economic ties to the US. The prospect of a Trump presidency, then, is popularly regarded as a significant economic threat to Mexican well-being, and numerous Mexican newspapers and politicians have been extremely critical of Mr. Trump's proposals.[1]

Although one might plausibly claim that a Trump election victory, followed by successful efforts to construct a border wall (at Mexico's expense) and renegotiate trade agreements in favor of US manufacturing, are somewhat unlikely to all occur, the mere possibility of such a result is perhaps sufficient to significantly impact various asset prices. While investors cannot short countries in the same manner in which they short companies' shares, there are several financial variables which one would expect to react in much the same way as option prices might to the evolving prospect of a Trump victory. The popular business press, for example, has focused particular attention of the dollar-peso exchange rate, and a number of articles have highlighted examples of (relatively) large moves in this rate which appear to exhibit a "real-time" correlation with significant presidential campaign events. For example, on October 9, 2016, Bloomberg reported that, "The peso jumped 1.5 percent to 19.0150 per U.S. dollar within an hour of markets opening in Asia on Monday." This is attributed to the leak of the audio tape purporting to document Mr. Trump boasting of past sexual behavior. Analysts interviewed for the article accepted the connection between Trump's political prospects and the dollar price of the peso: " 'The correlation between Trump's performance and trading with the peso seems to be clear to everyone by now,' said Marcin Lipka, a Warsaw-based currency analyst."[2] Recent popular press articles have titles that tell the same story: "Trump unexpectedly regains Florida lead in latest Bloomberg

[1] See, for example, the accounts cited by Abadi, " "Worse than a persona non grata" – what Mexican newspapers are saying about Trump's visit", Business Insider (www.businessinsider.com/trump-mexico-pena) Sep. 1, 2016.

[2] Filipe Pacheco, "Mexican Peso Soars to Month High Amid Furor Over Trump Tapes", Bloomberg.com (www.bloomberg.com/news/articles/2016-10-09).

poll; Peso Slides" (Bloomberg, Oct. 26, 2016); "Pound steadies; peso surges on Trump trouble" (CNBC, 10 Oct., 2016); "As Trump rises, the peso falls" (Financial Times, Sept 19, 2016); "Who won the debate? The Mexican peso says it wasn't Trump" (CNN, Sept. 27, 2016).

Although a link between Donald Trump's political fortunes and the value of the peso is plausible, there are several conceptual and practical difficulties associated with a formal investigation of this phenomenon. First, foreign exchange markets are extremely deep and operate at very high frequency, so the market rates change constantly. Even those who believe Mr. Trump has an effect on exchange rates would concede that his influence plays only a small role in the process determining prices. Second, although one can certainly identify a finite list of newsworthy events which might be taken to increase or decrease the chances for a Trump administration, most established political polls and poll-based election forecasts are not updated with high frequency and are often trailing indicators. It may take several days for a major political event to be fully reflected in standard polling. Thus, most variables which might provide a realistic assessment of Mr. Trump's chances are not particularly useful for analyzing any hypothetical link with rapidly fluctuating exchange rates.

The recent emergence of suitably capitalized political prediction markets, such as those operated by PredictIt.org, a non-profit trading platform sponsored by Victoria University of Wellington, New Zealand, provide a useful, high-frequency alternative to polling results. This project supports a market platform which facilitates real-time trading in simple binary contracts on political events in the U.S. and many other countries. Participants can place offers to buy or sell contracts which pay one dollar if a specified event occurs (e.g., "Donald Trump is elected President of the United States in 2016") and pay nothing otherwise. The prices of such contracts, which lie between \$0 and \$1, can be interpreted as probability assessments of the likelihood of the associated outcomes, reflecting "the wisdom of the crowd." Prices for the Trump contract have fluctuated since trading commenced on June 16, 2015. From low starting values of around 5 cents, the contract price had surged to highs of around 44 cents in late spring, 2016, before falling to around 20 cents in late October, 2016.

In this note, we take advantage of the PredictIt prediction market prices for the Trump contract to investigate the nature of the relationship between Mr. Trump's prospects and the US dollar-peso exchange rate. To perform this analysis, we use a VAR procedure incorporating the Trump contract prices (probability of winning), the nominal value of

the Mexican stock market index, the trade-weighted US dollar index, and the implied probability of a default on Mexican sovereign debt instruments utilizing the 5-year credit default swap spreads.

Our results provide some support for the "conventional wisdom": an increase in the probability Mr. Trump is elected President, as indicated by an increase in the price of the PredictIt Trump contract, has a significant negative effect on the dollar price of the peso. Impulse response function analysis suggests that a one cent increase in the Trump contract price reduces the value of the peso by almost 1/10th of one percent in about one week. Recalling that these are calculated as daily returns, and because the probability often changes by more than 5 percentage points (or 5 cents on the contract price), this effect is quite large. In contrast, our findings also indicate that this "Trump Factor" dissipates over a period of around 4 weeks, and it does not represent a permanent change in the terms of trade between the United States and Mexico.

The short run consequences of the Trump election chances for the Mexican stock market appear to be quite complex. An increase in the Trump contract price results in an immediate drop in the nominal value of Mexican equities followed about a week later by a significant increase in these values. This latter effect seems far easier to reconcile with simple open economy macroeconomic principles: one ordinarily expects depreciation in the currency of a small, open economy to stimulate export prospects, thus raising equity prices.

The implied default probabilities on Mexican sovereign debt instruments exhibit a response similar to that seen in the equity markets: after a short-lived spike upwards, a steady downward drift is observed and the probability of default becomes significantly lower after 4 weeks. These effects, though, are quite small.

The next section provides a compact description of the data series used in the analysis, and the VAR procedure. Section 3 presents our results from the VAR and associated Impulse Response analysis. We also evaluate the volatility of Trump contract prices, and show this volatility is translated to the foreign exchange market. We conclude that the "popular wisdom" associating Mr. Trump's circumstances with the value of the Mexican peso has some validity, although the nature of the relationship appears more nuanced than is usually assumed.

2 Data and Statistical Methodology

Our data comes from several sources. As described above, the probability Mr. Trump is elected president is represented by the price of a Trump contract as traded on PredictIt.org, a non-profit prediction market platform sponsored by Victoria University. Although this market has rules which place significant constraints on the sizes of trades allowed to members (the largest allowed individual trade is $850), the market is liquid and trades may be executed at any time.[3] Traders must verify their identities and fund their accounts to participate. Those wishing to close out their accounts may do so, receiving proceeds by check or bank transfer. The PredictIt.org platform is not classified as a gambling facility, as it has an educational exemption, and US citizens from all states except Washington and Nevada are allowed to open accounts. Trading is relatively expensive, however: profits withdrawn are subject to a 10% "tax" which is used to finance the site, and transactions costs are sufficiently high to allow contract prices to exhibit small but persistent irregularities.[4] Nonetheless, unlike political polls, prices on PredictIt.org are formed through free trading, and those who make unsuccessful bets lose their money. Our series of Trump contract daily prices runs from June 16, 2015 through Oct. 16, 2016.[5]

Our Mexican and other economic variables are obtained from public sources. The peso-dollar exchange rate (given by the number of pesos one dollar can purchase) is obtained from the FRED. We also obtained the trade weighted US dollar index from the same source. The nominal value of the Mexican stock market index denominated in local currency is obtained from the MSCI. We note that the Mexican stock market is well-capitalized, being valued at around 400-500 billion dollars during the period under study. We use the local currency denominated index instead of the dollar denominated index in order to avoid the outright exchange rate effect on the market value of the Mexican stock market. The probability of a Mexican default on sovereign obligations is proxied by the spreads on 5 year credit default swaps, as reported by Deutsche Bank Research.

Our raw data series are presented in Figure 1. We draw particular attention to the significant variation in the market odds on Trump's election. In contrast, the peso has suffered from a loss in value of almost 25% over this period, a highly-consequential deterioration.

[3] Each day, the platform is off-line for 30 minutes, beginning at 4 a.m. EST, for maintenance. Other than this hiatus, trading is continuous.

[4] For example, recent prices (October 28, 2016) implied Hillary Clinton had a higher chance of being elected president (79%) than any woman did (78%).

[5] These are "closing prices", recorded at the same time each day.

Mexican sovereign default risks exhibit no obvious pattern.

Figure 1 somewhere here

Our statistical approach utilizes the recursively identified vector autoregression model,

$$\mathbf{y}_t = \sum_{j=1}^{p} \mathbf{A}_j \mathbf{y}_{t-j} + \mathbf{C}\mathbf{u}_t,$$

where $\mathbf{y}_t$ is a vector of variables of interest: Trump's probability of winning (tp_t), the Peso-USD exchange rate, the MSCI-Mexico stock index, the default probability of Mexico, and the trade-weighted US dollar index (major currencies). $\mathbf{C}$ is a lower-triangular matrix and $\mathbf{u}_t$ is a vector of orthogonalized structural shocks. We demean and detrend all variables prior to VAR estimations using up to a quadratic time trend.

We order tp_t first in the VAR, because it seems reasonable that the Trump contract prices may influence other variables with a lag or even contemporaneously, whereas the other variables have limited or no influence on Mr. Trump's prospects, at least in the short-run. Note, however, that our subsequent impulse-response function estimates will be "ordering-free" due to the lack of contemporaneous feedback from the Trump contract to the other variables.

We include several control variables in this system. Even though the exchange rate variables and tp_t are measured at a daily frequency, macroeconomic variables that may explain the fundamental movements in the exchange rate are often available with monthly or quarterly frequency. Hence, we use the default probability of Mexico, inferred from the spreads observed on 5-year sovereign obligation credit default swaps, to control for the impacts of macroeconomic variables on the peso exchange rate, assuming that market participants respond to the credit default swap based on their expectations of the macroeconomic performance of Mexico. We also use the trade-weighted US dollar index to control for the overall dynamics of the dollar exchange rate.

3 Empirical Results

We begin by examining two scatter plot diagrams (Figure 2) to investigate the contemporaneous relationship between the price of the Trump contract and the peso-dollar exchange

rate. In the top panel, we display the scatter plot diagram generated by mapping the percent changes in the two series. The solid line denotes the fitted value from the least squares regression on these values. Contrary to the common belief in the business press, the fitted value line indicates virtually no relationship between these two variables. This absence of result arises because changes in the peso-dollar exchange rate reflect myriad forces beyond the "Trump Factor." To eliminate variations stemming from such fundamental economic forces, one may look at the business cycle components filtered using the quadratic detrending method.[6] The scatter plot diagram with the detrended peso-dollar series is presented in the lower panel. It should be noted that the least squares fitted line now exhibits a clear positive slope even though such clustered observations imply a large standard error.

Figure 2 around here

We turn next to the impulse-response function estimates from our VAR model. These allow us to investigate the dynamic relationship between Trump's winning probability and the peso-dollar exchange rate. We employ two lags ($p = 2$) by the AIC and the BIC with a maximum 6 lags. The estimated consequences of changes in the probability Donald Trump is elected president for exchange rates, stock prices, and market assessments of the probability of Mexican default, are illustrated in Figure 3. We also provide the associated 1 standard deviation confidence intervals, obtained from 500 nonparametric bootstrap simulations. The hypothetical experiment exhibited by the Figures assumes a 1 cent (1 percentage point) increase in the price of the Trump contract, and estimates the expected effect of that once and for all change on the variables of interest over the next 8 weeks.

Consider first the Trump Factor effects on the peso-dollar exchange rate. Analysis indicates that an increase in Mr. Trump's prospects cause a significant, though short-lived, depreciation in the peso, with an expected maximum effect (a 0.084% increase in the number of pesos a dollar will buy) occurring roughly one week later. After that point, the depreciation dissipates and becomes statistically insignificant after about 3 weeks.

Figure 3 around here

[6] We demean and detrended each time series with an intercept, linear, and quadratic time trends, then obtained residuals by subtracting fitted values from the raw data.

This level of adjustment (0.084%) is not a small response. As illustrated in Figure 4, Trump's probability of winning is a volatile series. Changes exceeding five percentage points can occur, and such large changes can generate changes in the Peso-Dollar exchange rate of about a half percent. Changes in Trump's winning probability generate substantial short-run disruptions in the peso-dollar exchange rate. While our technique and the nature of the sample do not support large generalizations of the results, it is evident that the largest short-term swings in Trump contract prices, which can change by around 5% in a matter of hours, can be expected to have very large effects on the exchange rate.

Figure 4 around here

Mr. Trump's prospects may have significant effects on asset markets that extend beyond affecting the levels (first moments) of prices. For example, the volatility in Mr. Trump's support may be transmitted to exchange rates. Thus, we also implemented a multivariate GARCH model (BEKK) to study any possible volatility spillover effect between the Trump Factor and the peso exchange rate. For this, we consider the following equation for the conditional variance-covariance matrix $\mathbf{H}_t$ with the residuals obtained from the bivariate VAR model with the Trump probability and the peso exchange rate. That is,

$$\mathbf{H}_t = \mathbf{M}'\mathbf{M} + \mathbf{A}^{'}\mathbf{e}_{t-1}^{'}\mathbf{e}_{t-1}\mathbf{A} + \mathbf{B}\mathbf{H}_{t-1}\mathbf{B}^{'},$$

where

$$\mathbf{M} = \begin{bmatrix} \omega_{11} & \omega_{12} \\ 0 & \omega_{22} \end{bmatrix}, \ \mathbf{A} = \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \end{bmatrix}, \ \mathbf{B} = \begin{bmatrix} \beta_{11} & \beta_{12} \\ \beta_{21} & \beta_{22} \end{bmatrix}$$

The off-diagonal elements of A and B provide information on the "news effect" and "volatility spillover effect", respectively, while diagonal elements represent the own ARCH and GARCH effects. For example, a significant estimate for β_{12} implies a statistically significant volatility spillover from the Trump probability to the peso exchange rate. We report the results of this analysis in Table 1.

The results are striking, and they are additionally consistent with our assumption that Mr. Trump's fortunes may move Mexican financial markets, but the converse is unlikely: we obtain highly significant volatility spillovers from the Trump Factor to the peso exchange rate, but not the other way around (i.e., insignificant β_{21}). That is, higher uncertainty in the Trump Facto tends to generate greater volatility in the peso exchange market.

The effect of the Trump contract price on the value of Mexican equities is striking, although no obvious explanation is forthcoming. After initially causing stock prices to fall, Mr. Trump's political fortunes seem to raise the value of the Mexican equities market, at least over the time scales encompassed in this (admittedly short run) analysis. The simplest explanation of this result would just rely on the stimulative effect of peso depreciation on exports and, therefore, corporate earnings. Similar to the response of the peso-dollar exchange rate, the positive response of stock prices to an increase in Mr. Trump's support eventually dies out, although stock prices exhibit much more persistent responses than those of the foreign exchange rate.

Evidence from the implicit probabilities of sovereign defaults is unpersuasive, although the distribution of the short-run responses are skewed toward the positive end, meaning that a higher probability of Trump's win is translated into a slightly greater sovereign default risk for Mexico. However, the findings suggest a very small response to the Trump factor.

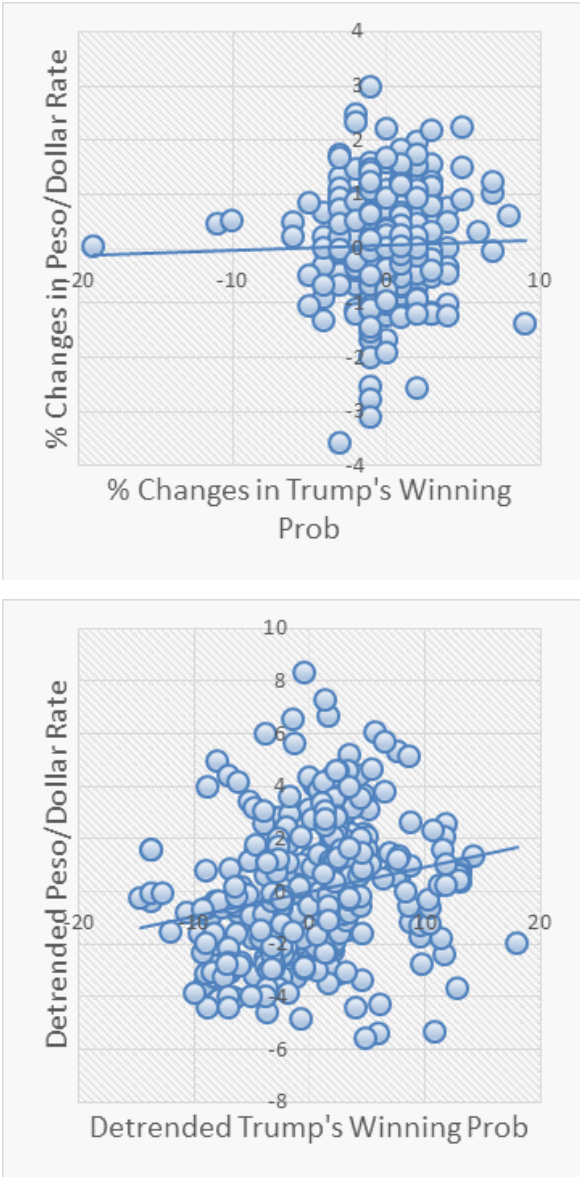
4 Conclusion

According to conventional wisdom, conventional wisdom is usually wrong. In the case at hand, though, conventional wisdom has shown itself to be partially correct. The statistical evidence presented here suggests that there is indeed a "Trump Factor" which affects the dollar-peso exchange rate, as many in the business press have suggested. However, this effect, though real, appears to be temporary, and after a few weeks a process of mean-reversion asserts itself. This suggests there are strong long-run economic forces governing the US- Mexican economic relationship.

Mr. Trump's influence on Mexican equity prices is more complex. It appears that his success is "bad news" for stocks in the immediate run, but after several weeks have passed prices are significantly, if only slightly, higher. Although the Trump effect on default risks is quite small, there is much stronger evidence that volatility in the Trump contract price is translated into volatility in exchange rates, and the converse is not true. This is not inconsistent with the conclusion that there is a Trump Factor which affects the levels of exchange rates, although the effects are theoretically independent. Neither Mr. Trump's supporters nor his critics are likely to dispute that he is a disruptive influence. Based on the analysis here, however, the disruptions may prove temporary.

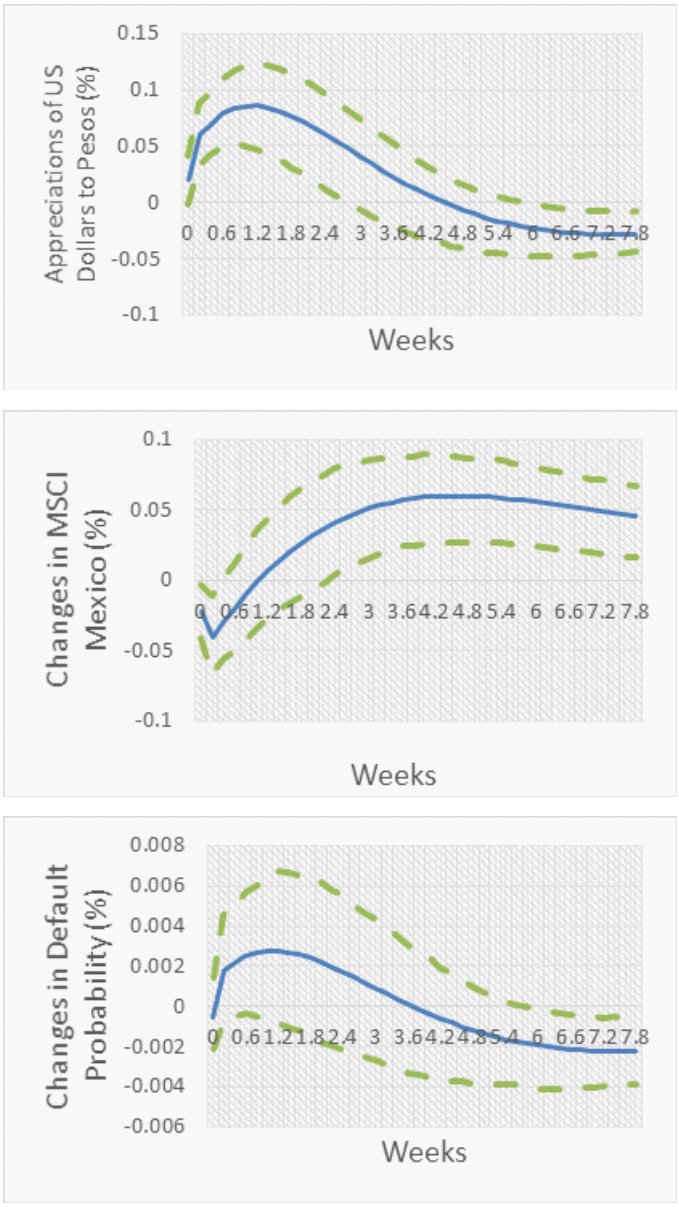
Figure 1. Data

Figure 2. Scatter Plot Diagrams



Note: The scatter plot diagram in the top panel is obtained after differencing the two series. The second panel diagrams are obtained from detrended series using adjustments up to a quadratic time trend. The solid lines are the least squares fitted values.

Figure 3. VAR Response Function Estimates to the 1%p Trump's Winning Probability Shock



Note: We obtain the 1 standard deviation confidence band from 500 nonparametric bootstrap simulations.

Figure 4. Percent Changes in Trump's Winning Probability

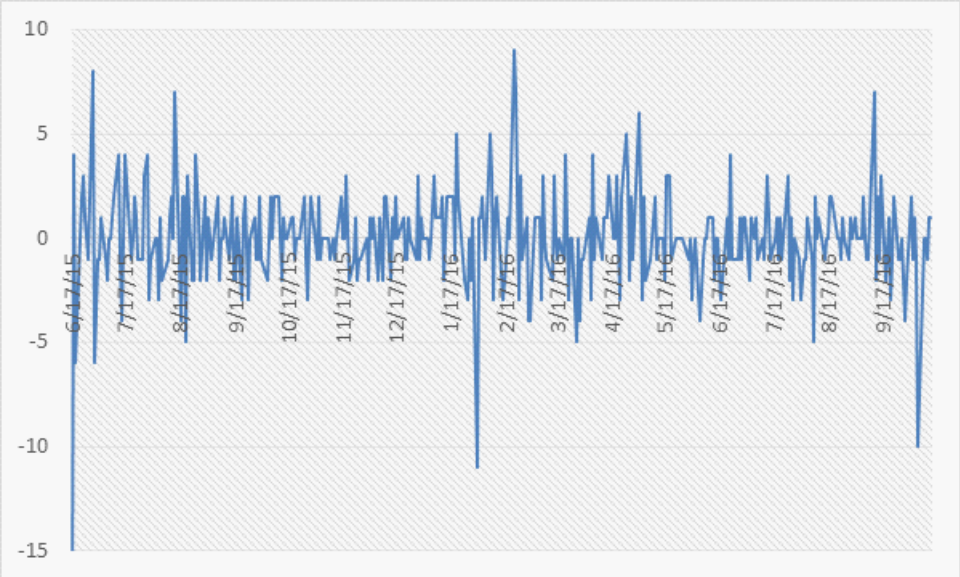


Table 1. BEKK Estimation Results

$$\mathbf{H}_t = \mathbf{M}'\mathbf{M} + \mathbf{A}^{'}\mathbf{e}_{t-1}^{'}\mathbf{e}_{t-1}\mathbf{A} + \mathbf{B}\mathbf{H}_{t-1}\mathbf{B}^{'}$$

$$\mathbf{e}_t = [e_{Trump,t}, e_{Peso,t}]$$

$$\mathbf{A} = \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \end{bmatrix}, \ \mathbf{B} = \begin{bmatrix} \beta_{11} & \beta_{12} \\ \beta_{21} & \beta_{22} \end{bmatrix}$$

	α_{11}	α_{12}	α_{21}	α_{22}	β_{11}	β_{12}	β_{21}	β_{22}
Estmates	−0.290	−0.039	−0.011	0.357	−0.078	−0.251	−0.561	0.682
Std. Error	0.007	0.008	0.929	0.013	5.499	0.008	1.463	0.130

Note: $e_t$is a 2 by 1 vector of residuals filtered by a VAR(1) process for Trump's probability and the peso exchange rate. Note that the sign of the estimates do not matter, because they appear in the variance equation with squared values. Brackets contain standard errors.