German Inflation in a Deflationary Eurozone: Macro-economic Analysis and Conclusions

By Rumi Masih, Ph.D.
Head of Investment Strategy
Sovereign Institutions Group
BNY Mellon Investment Management

Jeff Zhang
Chief Investment Officer
Mellon Capital Management

Chris Harris
Investment Solutions Strategist
BNY Mellon Investment Strategy
and Solutions Group*

EXECUTIVE SUMMARY

This report addresses a dilemma of the current economic situation in the Eurozone: that if ECB rates are held low for long enough, Germany may begin to experience inflation even if the rest of the Eurozone experiences deflation. If this is the case, we may either see a beneficial effect as rising wages boost consumption, or a harmful one, as German exports become less competitive. Using both quantitative and qualitative analysis of the situation, we conclude that wage inflation would be likely to have a positive effect on the German economy, clearly boosting consumption whilst having a surprisingly muted effect upon net exports.

Wage inflation would be likely to have a positive effect on the German economy.

INTRODUCTION

One feature of a single currency bloc such as the Eurozone is that monetary policy can no longer be customized to the situation of each country within it; instead, a single monetary policy setting must be applied to all countries at once. This raises the possibility that the appropriate interest rate for the bloc as a whole may be inappropriate for certain economies within that bloc. The obvious example of this at the current time would be the case of Germany in the Eurozone. Since 2009, the German economy has been performing better than the Eurozone as a whole (Figure 1). As a result of this, the ECB's relatively aggressive monetary policy stance – intended to prevent deflation in the weaker Eurozone economies – could create inflation in Germany. Currently, we do see that German inflation is a little higher than the Eurozone average, though not to a significant extent (see Figure 2).

If it is the case that German inflation runs higher than the Eurozone average, this could have two possible consequences; one desirable and one undesirable:

1. Higher German inflation decreases real interest rates and encourages spending rather than saving on the part of companies and households. Historically, the German savings rate has been fairly high (Figure 3) and so the private sector is indeed in a position to increase its spending. This increased consumption would boost the German economy. Given the tendency of capital in the Eurozone to flow

* BNY Mellon Investment Strategy & Solutions Group ("ISSG") is part of The Bank of New York Mellon ("Bank"). In the US, ISSG offers products and services through the Bank, including investment strategies that are developed by affiliated BNY Mellon Investment Management advisory firms and managed by officers of such affiliated firms acting in their capacities as dual officers of the Bank.

BNY MELLON

to Germany, and given generally low interest rates around the world, it seems unlikely that a decrease in the German savings rate would cause interest rates to increase in a manner which offset this benefit.

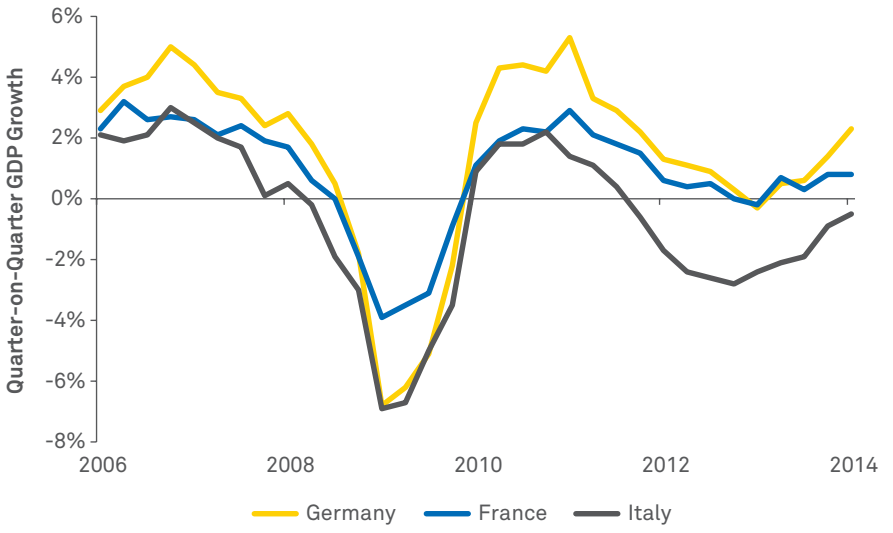
2. Higher German inflation boosts wage costs relative to the rest of the Eurozone, and increases German real effective exchange rates with other Eurozone members. This should cause Germany's current account surplus with other Eurozone members to decrease, and the reduced demand as a result would decrease economic momentum.

Higher German inflation boosts wage costs relative to the rest of the Eurozone.

Our challenge is therefore to establish which of these effects is likely to dominate, and hence whether higher German inflation is likely to be a help or a hindrance to the German economy and German capital markets. Our primary means of addressing this question will be empirical; we will use a form of regression to examine the effects of an increase in German wages on other key macroeconomic variables. However, we will also attempt to overlay these results with a common-sense macro-economic understanding of the present situation in the Eurozone and elsewhere. By combining statistical and logical methods, we hope to reach a more definitive conclusion on the topic.

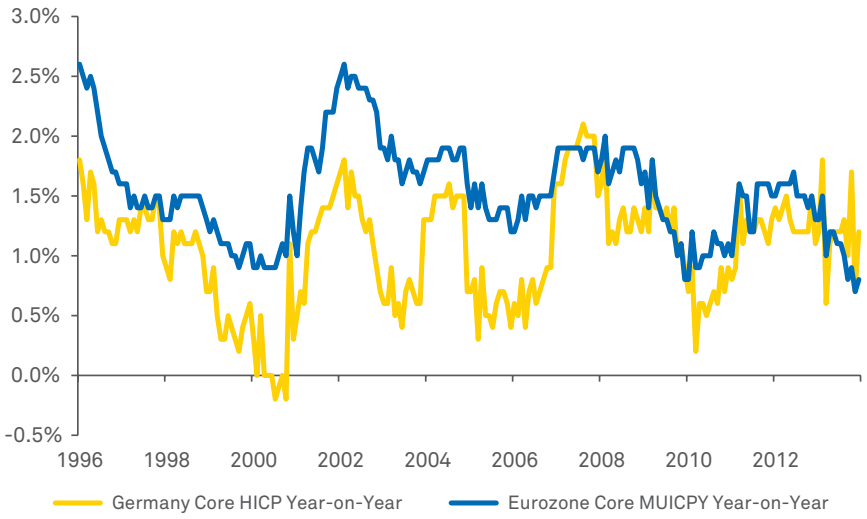
The "Statistical Analysis" section directly below presents the methodology and results of our regression. The "Macro-economic Observations" section that follows then discusses these conclusions from the standpoint of our views and understanding of the global macro-economic situation.

Figure 1: The German economy has consistently outperformed other Eurozone members



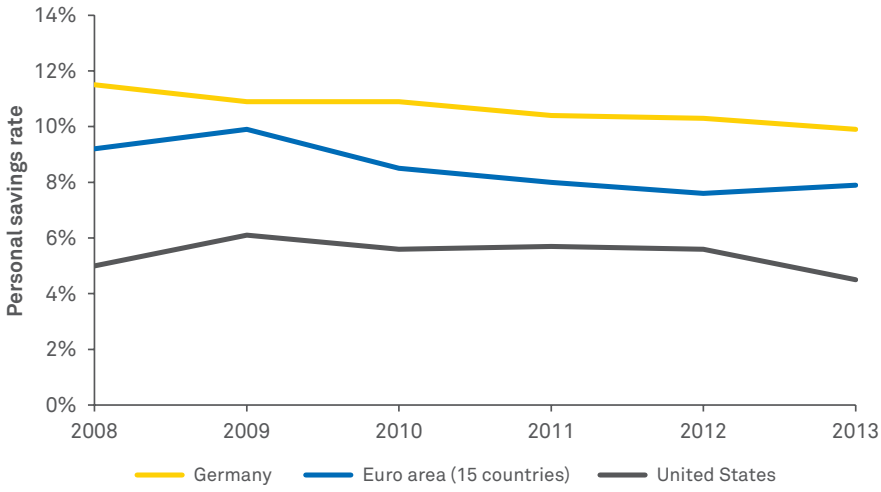
Source: Eurostat

Figure 2: German core inflation is somewhat higher than Eurozone average



Source: Eurostat

Figure 3: Germany has a relatively high personal savings rate



Source: OECD

It takes time for the economy to respond enough to rate decreases for the labor market to pick up slack.

STATISTICAL DATA AND METHODOLOGY

The variables that we consider relevant to this question and have included in our statistical analysis are shown below:

- German consumption
- German aggregate export values
- German aggregate import values
- Wage levels, measured by hourly manufacturing wage costs
- Price levels
- German interest rates (90-day Frankfurt Inter-bank Offer Rate, or FIBOR)

The data used for each variable were quarterly series running from Q1 1970 to Q3 2013. Further details of these variables can be found in the 'Data Used in Statistical Analysis' part of the appendix section.

We found that many of these variables had a tendency to grow over time. We also believe that many of these variables have a co-integrating relationship – a tendency to maintain a long-run relationship with one another (for example, consumption, imports and exports may all be expected to grow together with GDP). Both of these facts meant that a standard regression could produce spurious results. In order to account for these properties, we used a type of model known as a vector error-correcting (VEC) model. VEC models produce valid statistical inferences even if the input variables are non-stationary and co-integrating. Further details of our tests of the variables involved and the selection of the model used are presented in the 'Variable Testing and Model Selection' part of the appendix.

Numerous potential versions of VEC models were examined before we arrived at what we believed to be a correct definition for the model. Our definition uses the logarithm of the variables shown above, rather than those variables in their existing state. We should caution that it was not possible to find sensible VEC models which included rates as an endogenous variable. The client's assumption that low rates would cause wage inflation must therefore be taken as a premise, rather than a conclusion. We did, however, use a Grainger causality test to investigate this, which indicated that rates could affect wages but only after a lag of 2-3 years. This may be because it takes time for the economy to respond enough to rate decreases for the labor market to pick up slack.

RESULTS

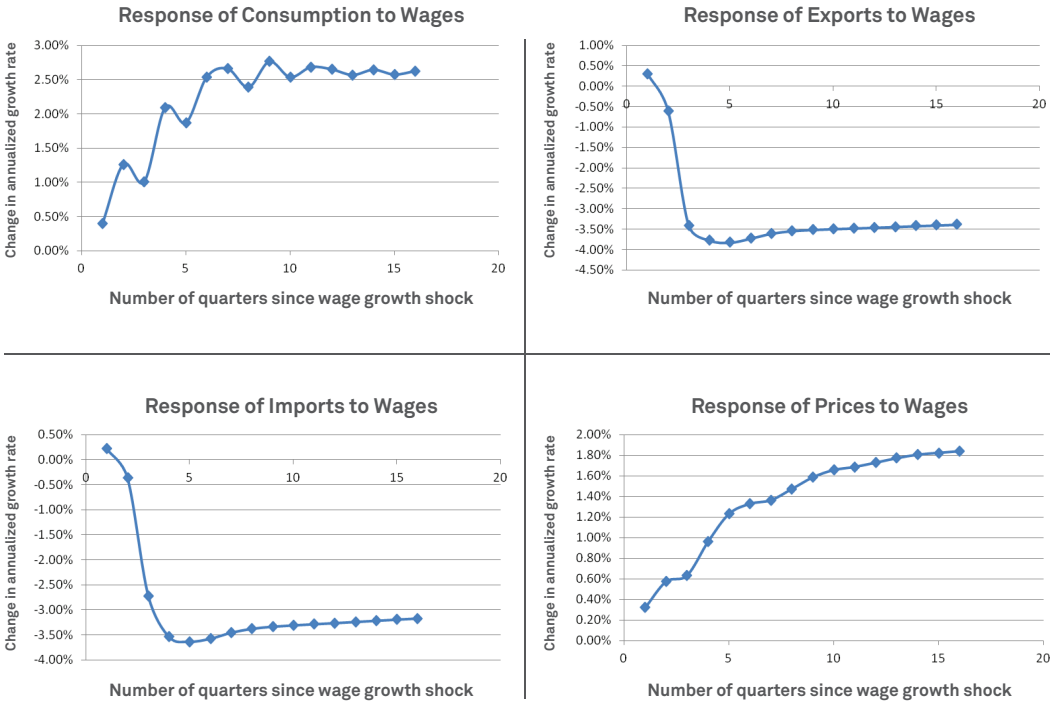
Our results can best be summarized by the generalized impulse response functions of the models used. Impulse response functions represent the response of one variable in the system to a shock to another variable. Thus, one of the variables is given a shock at time zero, with all other shocks being held equal to zero, and the system is allowed to evolve according to the equations of the model. The value of another (or the same) variable is then recorded over the subsequent time periods. Generalized impulse response functions apply a further technical correction in order to account for the correlation between the errors in the system, but give a qualitatively similar result. Typically the magnitude of the applied shock is chosen to be one standard deviation of the shocked variable, so that it will be a number typical of the variation in that variable.

However, since these models are VEC models in the logarithms of the variables, the relevant quantities are the differences of the logarithms, which are equal to the growth rates of the original variables. Thus the impulse response functions in this case will actually represent the response of the *growth rate* of one variable to a shock in the *growth rate* of another variable.

The responses of consumption, exports, imports, and prices to a one standard deviation shock in wages are shown below.

Note that imports decline in response to wage increases, contrary to what might be expected.

Figure 4: Impulse response functions to a one standard deviation shock in wages

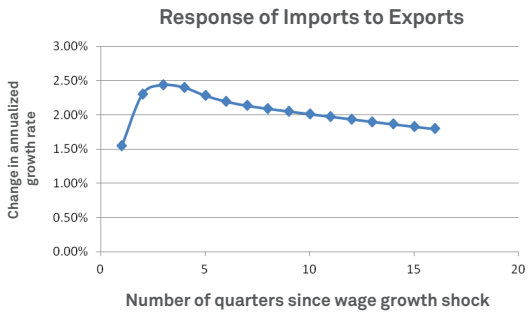


Source: Datastream data, analysis by ISSG

The vertical axes represent the response in the annualized growth rate of the variables to a shock in the growth rate of wages, so that a reading of 1% on the vertical axis corresponds to a 1% annualized rate of increase. The horizontal axis labels the number of quarters which has passed since the shock was applied. The magnitude of the shock to wage growth rates is 3.3% per year annualized, applied over the first quarter. After an initial adjustment of about three years, consumption settles out to an annualized rate about 2.6% per year higher than before. After a shorter initial adjustment of about three quarters, exports settle out about 3.2% per year lower, and imports to a level 3.0% per year lower. Finally, after a 3-4 year adjustment period, prices settle out to a level about 1.8% per year higher. Note that imports decline in response to wage increases, contrary to what might be expected. One possible explanation for this is that as finished goods exports decline, so do imports of the raw materials necessary to create these goods. This theory is supported by the positive response function of imports to exports.

These results can also be displayed as *accumulated* response functions.

Figure 5: Imports are responsive to changes in exports



Source: Datastream data, analysis by ISSG

These results can also be displayed as *accumulated* response functions. Whereas the response function gives the rate of the variables at a given point after the initial shock, the accumulated response gives the entire accumulated change from time zero up to that point in time, taking compounding into account. Thus a reading of 10% on the vertical axis represents a total 10% increase in the variable since time zero, as a result of the shock.

Figure 6: Cumulative response functions to a one standard deviation shock to wages

Source: Datastream data, analysis by ISSG

After the first 3 years there is an accumulated 6.18% increase in consumption, after which it continues to grow at the 2.6% annualized rate specified above. During the same period there is an 8.37% accumulated decrease to exports after which they continue to decline (or grow less quickly) at the 3.2% annualized rate specified above, and there is a 7.82% accumulated decrease to imports after which they continue to decline (or grow less quickly) at the 3.0% annualized rate specified above.

Finally, there is a 4.09% cumulative increase to prices, after which they continue to increase at a 1.8% annualized rate.

Translated into absolute amounts, based on Q3 2013 numbers, the cumulative changes for this period are a €24.4bn increase in consumption over a €394.9bn base value, a €29.0bn decrease to exports from a €346.1bn initial value, and a €23.8bn decrease to imports from a €304bn value. This entails a €29.7bn - €23.8bn = €5.9bn decrease to net exports. Thus although the difference to exports alone is greater than the difference to consumption, the cumulative increase to consumption significantly outweighs the cumulative decrease to net exports. This is the key finding of our statistical analysis. A similar outcome is also obtained if we adjust for changes in prices; we see a €7.9bn increase in real consumption outweighs a €3.3bn decrease in real net exports, though we caution that these results are sensitive to the model used to adjust inflation.[1]

It seems doubtful that Germany's export volumes should be significantly affected by wage costs or price inflation.

MACROECONOMIC OBSERVATIONS

In order to both complement and check our statistical analysis, we have attempted to consider the issue from a common-sense perspective, based on our understanding of the situation in the Eurozone and conventional macro-economics.

GERMAN EXPORTS MAY NOT BE SENSITIVE TO WAGE CHANGES

It seems doubtful that Germany's export volumes should be significantly affected by wage costs or price inflation. We make this assertion bearing in mind three points:

1. Eurozone members do not represent the bulk of Germany's trade. In 2013, only 36.9% of German exports were to other Eurozone members.[2] Within the Eurozone, wage cost adjustments are the only means of altering real effective exchange rates, and should therefore be a key factor driving export volumes over the long-term. However, for trade with countries outside of the Eurozone, currency values are also a factor in real exchange rates (and therefore export volumes). Given that currency values are significantly more volatile than wage costs, wage costs should not be a major factor driver of export volumes for extra-Eurozone trade. Bearing this in mind, we should not necessarily expect wage costs or price inflation to have a significant influence on German export volumes.

2. It is also noteworthy that in the period from 2007 onwards, Germany's current account balance has been relatively resilient to reduced demand from its Eurozone trade partners; as Europe declined as a share of German exports, exports to non-European countries increased, leaving Germany's overall current account balance relatively unchanged (see Figure 7).

3. Finally, both real effective exchange rates between Eurozone members, and trade balances between Eurozone members, have already substantially rebalanced towards their 2008 levels (Figure 8).

These conclusions are consistent with the results of our statistical analysis, which are that there is not a strong relationship between wage costs and net exports.

1 Though most of the models considered resulted in price inflation in this range, some resulted in cumulative price increases for this period as high as 7%. At this rate of inflation, using the same result for the other variables, real consumption actually decreases by 3b euro, while net exports decrease by 2.1b euro, a result which is sufficient to reverse the conclusion.

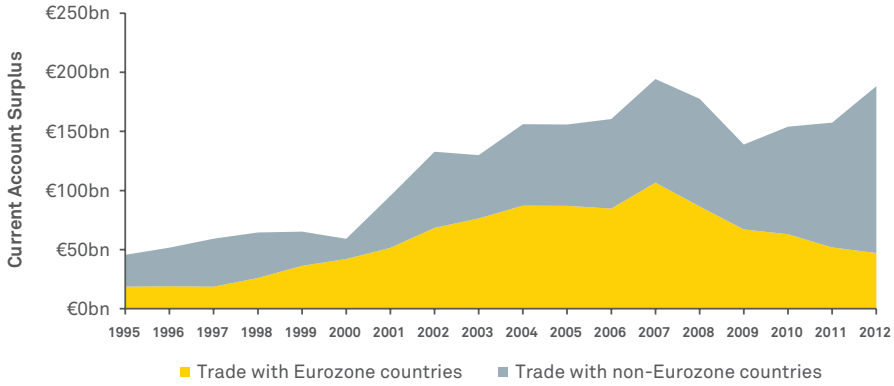
2 Source: Federal Statistical Office of Germany

Empirical evidence suggests that consumption is responsive to both permanent and one-off shifts in income.

THE RELATIONSHIP BETWEEN INFLATION AND CONSUMPTION

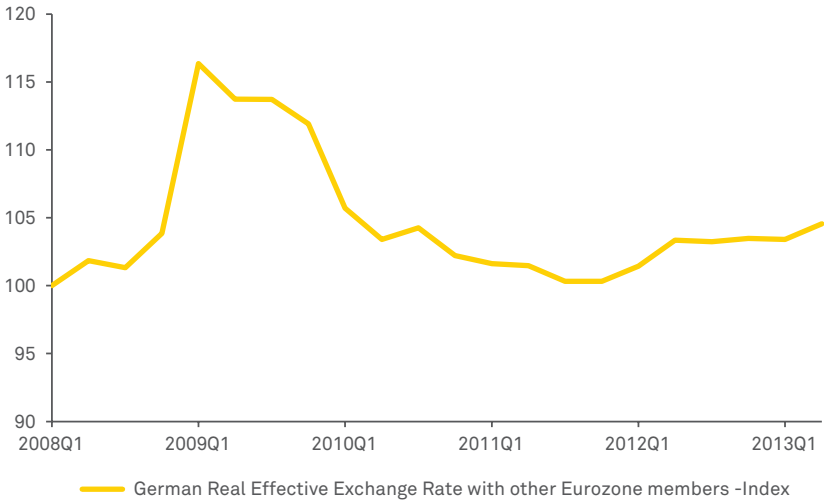
Empirical evidence suggests that consumption is responsive to both permanent and one-off shifts in income.[3] Though rising prices and rising wages should together not cause consumption to increase, reasonable evidence exists that economic participants tend to focus more on changes in wages than on changes in prices when making spending decisions; so-called 'money illusion' is a fairly well documented behavioral finance phenomenon.[4] We therefore see little reason to disagree with the results of our statistical analysis, that rising wages would boost German consumption.

Figure 7: Exports to the Eurozone represents relatively little of Germany's current account surplus



Source: Eurostat International Trade Database

Figure 8: German Real Effective Exchange Rates with other Eurozone members have normalized



Source: Zsolt Darvas, Real Effective Exchange rates for 178 countries: a new database, 2012; increases in this index indicate that German real effective exchange rates have increased.

3 Jappelli and Istaferri, *The Consumption Response to Income Changes,* 2010

4 Shafir, Diamond and Tversky, Money Illusion, 1997

CONCLUSION

Both our statistical analysis and our general economic views are roughly in alignment – that, speaking in terms of general directions, increases in wages can have an overall negative effect on nominal exports and a positive effect on nominal consumption. The surprising feature of this analysis is in the scale of the sensitivity to exports to changes in wages; German net exports appear to be relatively insensitive to wage costs. Though slightly counter-intuitive, this was a conclusion from our statistical analysis, and also makes sense when considered through a macro-economic lens. Because German net exports are not highly sensitive to wages, it is likely that the beneficial consumption effect would dominate if German inflation were to increase as a result of ECB rates being kept too low.

We should note that currently German wage costs and German price inflation, if anything, seem to be trending lower rather than higher. The scenario being discussed above is therefore inconsistent with current reality. However, this deflationary trend may be reversed if global demand increases, or if the ECB engages in more aggressive monetary policy. The second of these possibilities is something that has been the subject of recent wide discussion, with the IMF having called for more action from the ECB, and some market commentators predicting Eurozone quantitative easing in the second half of this year. If it is the investor's view that either of these two possibilities – increased global demand or more aggressive ECB monetary policy – are likely to occur, then a long investment position in German equity assets may be a way to benefit from this. In the event that the Eurozone remains weak and German inflation continues to trend lower, Germany may stand to benefit from a weak Euro.

If the eurozone remains weak and German inflation continues to trend lower, Germany may benefit from a weak euro.

APPENDIX

Data Used in Statistical Analysis

The Data used in the regression ran from Q1 1970 to Q3 2013, and were taken from Datastream. Further details are shown below:

Variable	Series Used	DataStream Mnemonic
Interest rates	OECD Main Economic Indicators 90-day Frankfurt Interbank Offered Rate (FIBOR)	BDQIR076R
Consumption	OECD Main Economic Indicators, Germany GDP by Expenditure, Private Final Consumption Expenditure	BDONA002B
Exports	OECD Main Economic Indicators, Germany GDP by Expenditure, Exports of Goods and Services	BDONA005B
Imports	OECD Main Economic Indicators, Germany, GDP by Expenditure, Imports of Goods & Services, less: imports of goods and services	BDONA006B
Wages	OECD Main Economic Indicators, Germany, Earnings, Manufacturing, Hourly	BDONA006B
Prices	OECD Main Economic Indicators, Germany GDP Deflator	BDQNA057E

In a standard regression model, the use of non-stationary variables can lead to spurious results.

VARIABLE TESTING AND MODEL SELECTION

A number of the variables were expected to tend to grow over time, rather than fluctuate about a fixed mean. Consumption, imports, exports and prices are all expected to grow over time with overall economic growth and with inflation. In statistical terms, they are non-stationary. The variables were tested for stationarity using a statistical test called the Augmented Dickey-Fuller test, and all of the variables were found to contain a single unit root, and therefore not to be stationary. This has several effects on the properties of a model incorporating these variables. Firstly, a change in one of the variables will tend to persist over time, since the variable does not tend to revert to a fixed mean. Secondly, in a standard regression model, the use of non-stationary variables can lead to spurious results.

Further, many of these variables are expected to have what is known as a co-integrating relationship. This means roughly that although the variables are expected to grow over time, they are expected to grow together and to maintain a long-run relationship with each other. For instance, consumption, imports, and exports may all be expected to grow more or less together with GDP.

In order to account for these properties, it is necessary to consider a type of model known as a vector error-correcting (VEC) model. VEC models allow valid statistical inferences to be made about regressions with non-stationary variables, and also allow for the existence of a long-term relationship between the variables. In this framework, there is a separate regression equation for each variable, regressing it onto the lagged values of each of the other variables. However, rather than regressing the variables onto each other directly, VEC models regress the *differences* of each variable onto the *differences* of the other variables, as in the following equations:

$$\mathrm{d}y_t = \alpha_1 + \beta_1 \mathrm{d}x_{t-1} + \epsilon_1$$
$$\mathrm{d}x_t = \alpha_2 + \beta_2 \mathrm{d}y_{t-1} + \epsilon_2$$

where $\mathrm{d}y_t = y_t - y_{t-1}$. In addition, a VEC model takes account of possible long-term relationships between the variables. Suppose that a relation of the form $ax + by + c = 0$ is expected to hold between the variables. Then then the full VEC equations would read:

$$\mathrm{d}y_t = \alpha_1 + \beta_1 \mathrm{d}x_{t-1} + \gamma_1 (ax + by + c) + \epsilon_1$$
$$\mathrm{d}x_t = \alpha_2 + \beta_2 \mathrm{d}y_{t-1} + \gamma_2 (ax + by + c) + \epsilon_2$$

When the long-term relationship is violated, the additional term causes the variables to change in such a way as to restore the relationship. The values of the coefficients α, β, and γ, as well as a, b, and c, are determined by the regression process. It is also possible to allow for trend terms, proportional to t, in both the co-integration equation and the regression equations.

A number of such models were considered. Among the criteria used for model selection were the presence of a co-integrating relationship among the variables, the t-statistics of the regression coefficients, the R^2 for the variables in the model, and the behavior of the impulse-response functions. (See the results section for an explanation of impulse response functions.)

The first models considered were VEC models in the original variables. These were unable to identify a co-integrating relation among the variables. So, in order to remove the overall scale from the variables, and to help identify a co-integrating relation, logarithms of the variables were used instead.

Models containing different combinations of log variables were also tried. In particular, different combinations of exports, imports, and net exports were considered. Since net exports can be zero or negative, the logarithm of this variable could not be considered. Instead, the difference of the logarithms of exports and imports, or the logarithm of the absolute value of the difference, was considered, as was omitting imports entirely, or treating imports and exports as separate variables. Models containing exports, wages, and consumption together were tried, but were found to give the counter-intuitive result that an increase in wages produced an increase in exports. They were rejected in favor of separate models containing either exports and wages, or exports and consumption separately. Finally rates were tried as both an endogenous and an exogenous variable.

Models containing exports, wages, and consumption together were tried.

Models with various lag intervals were also considered, as were models with different combinations of trend and intercept in the co-integration and regression equations. Statistical tests known as Grainger causality tests and lag exclusion tests were used to help shape the selection of lags, as was trial and error. Johansen co-integration tests were used to check for the presence of co-integrating relations with different combinations of trend and intercept.

Given the large number of permutations of models to choose from, one should be cautious about making multiple comparisons and 'data mining'. If enough models are tried, one may be found that appears to be meaningful simply by chance, without representing a true underlying relationship between the variables. The results were also sensitive to the particular model used. Many of the models considered either failed to find a co-integrating relationship, failed to find statistically significant relationships between the variables, or failed to explain much of the variance of the variables. Some of the models also produced counter-intuitive results for the impulse response functions, such as an increase in wages causing an increase in exports.

On the other hand, this concern might be somewhat mitigated by the fact that some of the choices made between models had justifications besides just producing better results: choosing separate models with fewer numbers of variables each focuses only on the relevant interactions and reduces the number of unknown parameters which need to be estimated, and using lag exclusion tests restricts the lags used to those that are statistically significant. Further, since many of the models tested are very similar, they are presumably not all independent, and this may reduce the effective number of different permutations from which to choose. Nevertheless, even though the models presented below give the expected results, one should be cautious about using them to make future predictions without further validation.

It was not possible to find sensible VEC models which included rates as an endogenous variable.

In the end it was decided to use different VEC models for the effects of wages on different variables. The first model includes log wages and log consumption, with a lag of two quarters. The second model includes log wages, log exports, and log imports, with lags of one, three and five quarters. The third model includes log wages and log prices, with lags of one through four quarters. All three models include interest rate, which is not a logarithm, as an exogenous variable, and allow for both a trend and an intercept in the equations. It was not possible to find sensible VEC models which included rates as an endogenous variable. The client's assumption that low rates would cause wage inflation must therefore be taken as a premise, rather than a conclusion (although a Grainger causality test was done to investigate this, and indicated that rates could affect wages but only after a lag of 2-3 years; this may be because it takes time for the economy to respond enough to rate decreases for the labor market to pick up slack).

BNY Mellon Investment Management is one of the world's leading investment management organizations and one of the top U.S. wealth managers, encompassing BNY Mellon's affiliated investment management firms, wealth management organization and global distribution companies. BNY Mellon is the corporate brand of The Bank of New York Mellon Corporation and may also be used as a generic term to reference the Corporation as a whole or its various subsidiaries generally.

The information in this document is not intended to be investment advice, and it may be deemed a financial promotion in non-U.S. jurisdictions. Accordingly, where this document is used or distributed in any non-U.S. jurisdiction, the information provided is for Professional Clients only. This material is not for onward distribution to, or to be relied upon by, retail investors.

Any statements and opinions expressed in this document are as of the date of the article, are subject to change as economic and market conditions dictate, and do not necessarily represent the views of BNY Mellon or any of its affiliates. The information contained in this document has been provided as a general market commentary only and does not constitute legal, tax, accounting, other professional counsel or investment advice, is not predictive of future performance, and should not be construed as an offer to sell or a solicitation to buy any security or make an offer where otherwise unlawful. The information has been provided without taking into account the investment objective, financial situation or needs of any particular person. BNY Mellon and its affiliates are not responsible for any subsequent investment advice given based on the information supplied. This document is not investment research or a research recommendation for regulatory purposes as it does not constitute substantive research or analysis. To the extent that these materials contain statements about future performance, such statements are forward looking and are subject to a number of risks and uncertainties. Information and opinions presented in this material have been obtained or derived from sources which BNY Mellon believed to be reliable, but BNY Mellon makes no representation to its accuracy and completeness. BNY Mellon accepts no liability for loss arising from use of this material. If nothing is indicated to the contrary, all figures are unaudited.

Any indication of past performance is not a guide to future performance. The value of investments can fall as well as rise, so you may get back less than you originally invested.

This document is not intended for distribution to, or use by, any person or entity in any jurisdiction or country in which such distribution or use would be contrary to local law or regulation. This document may not be distributed or used for the purpose of offers or solicitations in any jurisdiction or in any circumstances in which such offers or solicitations are unlawful or not authorized, or where there would be, by virtue of such distribution, new or additional registration requirements. Persons into whose possession this document comes are required to inform themselves about and to observe any restrictions that apply to the distribution of this document in their jurisdiction. **The investment products and services mentioned here are not insured by the FDIC (or any other state or federal agency), are not deposits of or guaranteed by any bank, and may lose value.**

This document should not be published in hard copy, electronic form, via the web or in any other medium accessible to the public, unless authorized by BNY Mellon Investment Management.

This document is approved for Global distribution and is issued in the following jurisdictions by the named local entities or divisions: **UK and in mainland Europe (excluding Germany)**: BNYMIM EMEA, BNY Mellon Centre, 160 Queen Victoria Street, London EC4V 4LA. Registered in England No. 1118580. Authorized and regulated by the Financial Conduct Authority. • **Germany**: Meriten Investment Management GmbH which is regulated by the Bundesanstalt für Finanzdienstleistungsaufsicht. • **Dubai, United Arab Emirates**: Dubai branch of The Bank of New York Mellon, which is regulated by the Dubai Financial Services Authority. This material is intended for Professional Clients only and no other person should act upon it. • **Singapore**: BNY Mellon Investment Management Singapore Pte. Limited Co. Reg. 201230427E. Regulated by the Monetary Authority of Singapore. • **Hong Kong**: BNY Mellon Investment Management Hong Kong Limited. Regulated by the Hong Kong Securities and Futures Commission. • **Japan**: BNY Mellon Asset Management Japan Limited. BNY Mellon Asset Management Japan Limited is a Financial Instruments Business Operator with license no 406 (Kinsho) at the Commissioner of Kanto Local Finance Bureau and is a Member of the Investment Trusts Association, Japan and Japan Securities Investment Advisers Association. • **Australia**: BNY Mellon Investment Management Australia Ltd (ABN 56 102 482 815, AFS License No. 227865). Authorized and regulated by the Australian Securities & Investments Commission. • **United States**: BNY Mellon Investment Management. • **Canada**: Securities are offered through BNY Mellon Asset Management Canada Ltd., registered as a Portfolio Manager and Exempt Market Dealer in all provinces and territories of Canada, and as an Investment Fund Manager and Commodity Trading Manager in Ontario. • **Brazil**: this document is issued by ARX Investimentos Ltda., Av. Borges de Medeiros, 633, 4th floor, Rio de Janeiro, RJ, Brazil, CEP 22430-041. Authorized and regulated by the Brazilian Securities and Exchange Commission (CVM). The issuing entities above are BNY Mellon entities ultimately owned by The Bank of New York Mellon Corporation

BNY Mellon Cash Investment Strategies is a division of The Dreyfus Corporation. • BNY Mellon Western FMC, Insight Investment Management Limited and Meriten Investment Management GmbH do not offer services in the U.S. This presentation does not constitute an offer to sell, or a solicitation of an offer to purchase, any of the firms' services or funds to any U.S. investor, or where otherwise unlawful. • BNY Mellon Western Fund Management Company Limited is a joint venture between BNY Mellon (49%) and China based Western Securities Company Ltd. (51%). The firm does not offer services outside of the People's Republic of China. • BNY Mellon owns 90% of The Boston Company Asset Management, LLC and the remainder is owned by employees of the firm. • BNY Mellon owns a 19.9% minority interest in The Hamon Investment Group Pte Limited, the parent company of Blackfriars Asset Management Limited and Hamon Asian Advisors Limited both of which offer investment services in the U.S. • The Newton Group ("Newton") is comprised of the following affiliated companies: Newton Investment Management Limited, Newton Capital Management Limited (NCM Ltd), Newton Capital Management LLC (NCM LLC), Newton International Investment Management Limited and Newton Fund Managers (C.I.) Limited. NCM LLC personnel are supervised persons of NCM Ltd and NCM LLC does not provide investment advice, all of which is conducted by NCM Ltd. Only NCM LLC and NCM Ltd offer services in the U.S. • BNY Mellon owns a 20% interest in Siguler Guff & Company, LP and certain related entities (including Siguler Guff Advisers LLC).

The Alcentra Group
ARX Investimentos Ltda
BNY Mellon Cash Investment Strategies
BNY Mellon Western Fund Management Company Limited
The Boston Company Asset Management, LLC
CenterSquare Investment Management, Inc.
CenterSquare Investment Management Holdings, Inc.
The Dreyfus Corporation
EACM Advisors LLC
Hamon Investment Group
Insight Investment
Mellon Capital Management Corporation
Meriten Investment Management
The Newton Group
Siguler Guff & Company LP
Standish Mellon Asset Management Company LLC
Walter Scott & Partners Limited

BNY MELLON

August 2014 W-2014-0610-GU January 31 2015