Financial and economic stability as 'two sides of a coin': Non-crisis regime evidence from the UK based on VECM

Abstract
Purpose - This study analyzes the association between financial and economic stability from a new perspective. We revisit the existing understanding of the concept of financial stability in its relation to financial instability in order to then investigate some of the associations between economic stability and financial and price stability.
Design/methodology/approach – It is based on six pillars of financial stability and construct a vector error correction model (VECM) for a UK dataset for the period 1985 (Q1) to 2008 (Q2).
Findings – …… The findings provide a justification for macro-prudential approaches to the finance system.
Research limitations/implications (if applicable)
Practical implications (if applicable)
Originality/value (mandatory)

Keywords Financial stability, Economic stability, Price stability, Foreign exchange

Research type Research paper

JEL Classification: B26; E44; G01

1. Introduction

The Global Financial Crisis, which began September 2008, resulted in a fundamental shift in perception regarding the financial sector. Borio (2011, 26) argues that "financial and macroeconomic stabilities are two sides of the same coin". However, an important issue is how to define the stability of the financial sector. Foot (2003) notes there is currently no single and comprehensive definition of financial stability and that it is difficult to derive one. However, he argues it could be defined in the context of financial asset price volatility and the generality of financial markets and institutions. Concomitantly, Goodhart (2004, 2) also notes that, "Indeed there is currently no good way to define" financial stability. Khorasgani (2010, 20-21) states that "There is no consensus on a definition of financial instability." Khorasgani's study suggests a need for a broader conception. To provide such a conception, Filardo (2008) suggests beginning from better measures of financial instability. For the purpose of this study, we define financial instability as a situation in which economic performance is significantly impaired by fluctuations in the price of financial assets, or in the ability of financial intermediaries to meet their contractual obligations.

A significant issue is how to appropriately measure and contextualize financial instability in relation to financial *stability*. Seminal work has been done here by Reinhart and Rogoff (2009)[1] based on six financial aggregates, each associated with a specific threshold in terms of which the onset of financial instability is defined: a currency crisis (a Forex decline of 15%.), an inflation crisis (20% CPI), a stock market crisis (an index decline of 25%), a foreign debt crisis (government default), a domestic debt crisis (default), and a banking crisis (a run, bankruptcy etc.). However, one potential problem with this approach is that the threshold itself becomes a focus of analysis (see some of the problems identified by Ho 2004; Hagen and Ho 2007).[2] More specifically, any state of affairs below the threshold is by implication deemed stable.

In this paper we adopt a more inclusive approach to aggregates. We do so by placing a broader context around the issue of financial stability and instability. Rather than seek to identify a threshold we explore the implications of financial aggregates within broader economic contexts and over a duration that is *not* restricted to one designated as a period of crisis. Specifically, we use UK data from the period 1985 (Q1) to 2008 (Q2).[3] In so doing we select a different set of aggregates than those chosen by Reinhart and Rogoff (2009). We term these six pillars of financial *stability*: the bond market yield, the domestic lending rate to UK residents, the inflation rate, the spot exchange rate, GDP, the deficit to GDP ratio, and stock-market returns based on an index measure. The purpose of taking this approach is to constructively move beyond a narrow focus on periods of crisis.

Much of the research conducted on financial instability has focused on extreme disturbances in the financial sector (Bordo et al. 2003). However, financial instability is not necessarily the same as crisis. If one does not focus on thresholds one can also capture periods of relative instability in relation to stability. This can allow a broader analysis of the relation between aspects of stability and instability. This is important because it facilitates a focus on financial stability that does not neglect the lesser episodes or instances of instability. These too are significant for an adequate understanding of an economy. This is so in two ways:

1. As a matter of concern for public policy, periods of relative financial stability are also significant in terms of economic performance. The focus should not simply be on what is to be avoided, but also on what conditions are associated with more stability.
2. As a corollary of 1, in terms of focus, the *ex ante* tendency towards an economic disturbance, not the actual damage *ex post* is equally as significant in terms of instability as the crossing of a given threshold.

The paper proceeds as follows, in Section 2 we briefly review the existing evidence on the importance of financial stability for economic stability. In Section 3 we set out and justify the definitions and data sources for the six pillars of financial stability. In Section 4 we set a vector error correction model (VECM) as a means to analyze the association between the stated six pillars of financial stability and economic stability/instability and then analyze our findings. Our

[1] Though in the context of a longer tradition of events focused modelling, see Kaminksy and Reinhart (1999), Honohan (1997) and contrast with Hardy and Pazarbasioglu (1998).

[2] Though the purpose here is to create a different approach to thresholds.

[3] Note: a period of relative stability is not also to be conflated with an absence of cumulative problems. The great moderation, for example, was ostensibly a period of price and to some degree financial stability, but is also widely criticized because it was also a period of cumulative changes, which resulted in financial crisis (see Borio 2011 and Section 2 hereafter).

objective is to test the possible associations of these 6 with economic stability (represented by real GDP) and then, given the historical/theoretical emphasis placed upon it, price stability (represented by the CPI). As such we restrict our presentation of the model to a reduced 2 equations form. We augment the model findings with an Impulse Response Function. The key point we wish to emphasize is that important associations can be identified between economic stability, financial stability and price stability based on the associations that arise through our six pillars of financial stability. It then follows based on the Impulse Response Functions that instability creates adverse effects that we would argue providing a justification for macro-prudential approaches to the finance system.

2. The significance of financial (in)stability and the limits of price stability

As noted in the introduction, there is a general lack of consensus regarding a comprehensive definition of both financial instability and stability. However, for the purposes of this study we require only a generic working definition of each, since the basis of our approach resists a focus on thresholds and so also initially requires no definitive translation of the general concept of (in)stability into specific quantities. As such we adopt Schioppa's (2002, 20) working definition, 'financial stability is a condition where the financial system is able to withstand shocks without giving way to cumulative processes, which impair the allocation of savings to investment opportunities and the processing of payments in the economy'.[4] Concomitantly, financial instability may be generally defined as, a situation in which economic performance is potentially impaired by fluctuations in the price of financial assets, or in the ability of financial intermediaries to meet their contractual obligations.[5]

The significance of the finance sector and of financial stability for the real economy has been recognized for more than a century (for seminal work see Bagehot 1873). The prominence of analyses of the adverse consequences of financial instability tends to follow on from the manifestation of financial crises (see Minsky 1974, 1982; Kindleberger 1978) and there have been many different approaches to the broad conceptual problem of investment, saving and the role of banking (some of which currently revolve around issues of endogenous versus exogenous money). Most of the existing studies of financial stability have been from the perspective of the causes and consequences of *instability*, subject to a focus on extreme and relatively rare events. Conversely, a great deal of economics theory is about the forces that create market equilibrium rather than addressing those that creates market disequilibrium, ignoring the kinds of endogenous behavioral processes explored by Minsky or Kindleberger within finance. It is only relatively recently that the burgeoning finance literature has started to consider the two in a more nuanced way (see e.g. Gertler 1988).

One major issue to arise from the recent global financial crisis has been an acknowledgment of the problem of price stability. It has been widely recognized that although price stability is a desirable aspect of an economy the existence of such price stability is not in itself a guarantor of

[4] Of course 'without giving way to cumulative processes' does not imply that there are no qualitative and quantitative changes occurring that may become cumulative and problematic in the future – stability is a conditional feature and not a fixed constituent; otherwise, the definition would be perverse since periods of stability could only become periods of serious instability due to exogenous x factors rather than endogenous processes.

[5] Mishkin (1991) provides a similar generic definition.

long-term financial stability. However, price stability *and* financial stability are important contributory factors for economic stability, since they create sustainable confidence amongst depositors and investors resulting in stabilizing expectation effects expressed, for example, in bank relations and through money markets (Arouri et al. 2013). Moreover, one of the permissive causes of the recent financial crisis was the failure to recognize the need for both price and financial stability to be focused upon, creating a policy blindspot in terms of warnings regarding macroeconomic stability (leading then to policy calls for macro-prudential regulation; for issues see Borio 2011; Blanchard et al. 2010; Gros 2010; White 2006).[6] In this context, Borio states: 'financial and macroeconomic stabilities are two sides of the same coin' (Borio 2011, 26). Given this, it seems reasonable to develop a focus on the relations between aspects of finance and the macro-economy and not to restrict such a focus to periods of manifest financial instability, but rather to explore also periods of apparent stability in order to provide insights into those relations.

Intuitively, one would anticipate that there are relations between financial and macro-economic stability, including price stability. This is contingently confirmed by Bordo et al. (2003), who explore the impact of price levels on financial stability in the UK based on data from 1796-1999. According to Bordo et al. (2003), price level shocks had a considerable impact on financial instability in the UK.[7] However, the Bordo study is uni-dimensional and was only able to identify the impact of price (in)stability on financial (in)stability. This limits its insight for policy. Our study seeks to move beyond this (see Sections 3 & 4 hereafter). In doing so, however, we recognize that policy involves crisis and non-crisis regimes (Nasir and Soliman 2014). For example, Martin and Milas (2012) find (using monthly data, M) that there have been significant differences in monetary policy in the UK between periods of crisis (2007M5-2010M7) and non-crises (1992M10-2007M4).[8] Baxa et al. (2013) also note such differences across a range of major central banks (The Fed, Bank of England, Reserve Bank of Australia, Bank of Canada and Sveriges Riskbank), though the scale of intervention varied.[9] According to Baxa et al. (2013) the central bank focus during periods of stress was primarily on the stock

[6] Even Fred Mishkin (2011, 30-31), who prior to the global financial crisis was considered the main orthodox proponent of narrowly focused central bank policy now states: "The price and output stability do not ensure financial stability. Policy focus solely on these (output, inflation) objectives may not be enough to produce good economic outcomes". However, there is some dissent regarding this claim (see Nakov and Thomas 2011).

[7] Bordo et al. (2000) construct an Annual Index of Financial Conditions based on the categories: severe financial distress, moderate distress, normal, financial expansion and financial euphoria. The index was based on bankruptcies, corporate insolvencies and asset prices. They find that the impact has generally decreased in the post World War II period, perhaps because of (until the 1990s) more effective regulation. Most important point here is that they were looking at the one direction, which was impact of price level on financial instability not the other way round.

[8] According to Martin and Milas (2012), monetary policy has significant impacts on inflation and output but these do not persist during periods of manifest crisis since the focus of policy responses shifts towards the causes of financial stress.

[9] The study focuses on financial stress using the International Monetary Fund's (IMF) Financial Stress Index. The FSI has three subcomponents: the banking sector (the slope of the yield curve, TED spread, and the beta of banking-sector stocks), securities markets (corporate bond spreads, stock-market returns and time-varying volatility of stock returns) and exchange rates (time varying volatility of NEER changes).

market and banking. However, we follow Ostry et al. (2012) and propose that foreign exchange rates are also a significant area of concern in terms of financial stability.[10]

In the broadest terms the financial sector consists of several components including capital markets, sovereign debt markets, and foreign exchange markets. Since there are different components there can also be different aspects of (in)stability related to these components (see Filardo 2008). As noted in the introduction, Reinhart and Rogoff (2009) explore these components based on six financial aggregates as a measure of financial instability. We take a slightly different approach, focusing on six financial aggregates as 'pillars of financial stability' and do so without a focus on thresholds or a default to periods of manifest crisis. We set these out in the next section.

3. Data and the six pillars of financial stability

This study aims to analyze how measures of financial stability perform in periods of relative stability. We use UK data from the period 1985 (Q1) to 2008 (Q2). The data is obtained from the Bank of England, from the World Bank's database World Development Indicators, from the FTSE 100 historical prices archive and from the Office of National Statistics. We stop at Q2 2008 because the global financial crisis manifests in Q3 and this period is already well-covered by a variety of other researchers and with reference to Reinhart and Rogoff's thresholds. Our focus is on non-crisis.

We consider the following six financial aggregates as indicators of financial and economic stability:

- Bond Market Yield (BMY hereafter): we reconstructed the raw monthly Real Government Liability Curve (GLC) data from the Bank of England UK yield curve (forward curve) on 10 year UK Government bonds (Gilts) as a quarterly average, 1985 (Q1) to 2008 (Q3).[11] We selected this dataset (following Campbell 1995) because it is adjusted for inflation and because the forward yield curve incorporates the expectations of significant economic agents and so also reflects the decision making process of those agents that may manifest as forms of observable stability and instability (fluctuations). As such it reflects the confidence of market participants and investors in bonds as well as returns on investment (See Gulley and Sultan 2003; Nasir and Soliman 2014). The yield on bonds is also important for the government as it represents its borrowing cost. We consider this cost to be of interest at any level rather than, following Reinhart and Rogoff (2009), an indicator that signals an ostensibly (which is now disputed, see Hernden et al. 2014) prohibitive threshold.
- Domestic Lending to Income Ratio for UK residents (DL hereafter): we applied a linear interpolation to the World Bank annual domestic credit to private sector (% of GDP) data for the UK to derive quarterly estimates, 1985 (Q1) to 2008 (Q3).[12] We selected this

[10] One might also note that central bank policy is evolving. Since 2008 the Bank of England as published a biannual systemic risk survey, which canvases the opinion of risk directors amongst a sample of hedge funds, banks, building societies, asset managers and insurers in order to construct a snapshot of the general foci of contemporary concern: geopolitical risk, sovereign risk, operational risk etc (see Appendix).

[11] Dataset available as xls format from: http://www.bankofengland.co.uk/statistics/Pages/yieldcurve/archive.aspx

[12] Dataset available as xls format from: http://data.worldbank.org/indicator/FS.AST.PRVT.GD.ZS

dataset because it encompasses a wide range of lending organizations and also both secured and unsecured lending.[13] As such it provides a relatively comprehensive picture of lending. If one acknowledges the interconnection between borrowing, consumption and investment then changes in the ratio of domestic lending to income are of significance both as sources of economic activity and of *potential* future (in)stability prior to any other manifestation of crisis.[14] As noted in the introduction, it may have *ex ante* significance.

- Stock-market returns (SMR hereafter): we converted the raw monthly adjusted closing price data for the FTSE 100 index to a quarterly average, 1985(Q1) to 2008 (Q3).[15] We selected this dataset rather than the FTSE All Share, 350 or 250 because the 100 constitutes approximately 80% of the capitalisation of equity markets and contains most of the corporations which institutional investors are empowered to trade and so is the main focus of significant trading activity. Stock-market activity is widely acknowledged to be important because it creates wealth effects (see Airaudo et al. 2008, and Tsouma 2009), and is also a potential site where adverse effects can begin or be observed (Friedman 1988, for example, notes that a rise in stock prices may create a knock on effect to rising expected/offered returns on risky assets, whilst a rise in the volume and frequency of financial transactions creates a further transactional demand for money; see also Funke et al. 2010). Again, as with the BMY we consider SMR to be of potential interest at levels below any threshold set to capture manifest crisis, recalling that Reinhart and Rogoff (2009) identify an index decline of 25% as a threshold, which for an index rather than a given sector or equity is both relatively rare and more indicative of *ex post* damage.
- Inflation Rate (INF hereafter): we converted Office of National Statistics monthly Retail Price Index (RPI) series data (base year 1974) to a quarterly average, 1985 (Q1) to 2008 (Q3).[16] Although the Treasury and Bank of England's preferred measure of inflation is now the Consumer Price Index (CPI) we have selected the RPI because it was the preferred measure for much of the period under analysis (and the CPI was only introduced in 1992). Moreover, the RPI is more comprehensive, since it includes items such as mortgage payments, rents and council tax (and is based on a different calculation of the mean – arithmetic rather than geometric); the RPI is typically higher than the CPI.[17] Since the 1980s price stability has been a primary concern of modern monetary

[13] Specifically: 'financial resources provided to the private sector by financial corporations, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim for repayment. The financial corporations include monetary authorities and deposit money banks, as well as other financial corporations where data are available (including corporations that do not accept transferable deposits but do incur such liabilities as time and savings deposits). Examples of other financial corporations are finance and leasing companies, money lenders, insurance corporations, pension funds, and foreign exchange companies.' http://data.worldbank.org/indicator/FS.AST.PRVT.GD.ZS

[14] See also Albero (2011).

[15] Adjusted for dividends and splits. The dataset is publically available via several platforms. See http://www.ftse.com/analytics/factsheets/Home/HistoricIndexValues or https://uk.finance.yahoo.com/q/hp?s=%5EFTSE

[16] The dataset is available at: http://www.ons.gov.uk/ons/datasets-and-tables/data-selector.html?cdid=CDKO&dataset=mm23&table-id=3.5

[17] For the calculations and periodic changes to the weighting system see http://www.ons.gov.uk/ons/guide-method/user-guidance/prices/cpi-and-rpi/cpi-and-rpi--updating-weights/index.html See the Royal Statistical Society (RSS) working party analysis of the key differentials between RPI and CPI, Leyland (2011)

policy pursued through central banks (focused initially on the money supply but later on nominal interest rates) and the framework of concerns of both modern economic theory and general economic policy has also supported this (based on a policy ineffectiveness approach to tradeoffs between inflation and a natural rate of unemployment unless supply side issues are addressed). Concerns over price stability arise far in advance of Reinhart and Rogoff's threshold of 20% CPI; the Bank of England, for example, target 2%.

- Spot exchange rate (SER hereafter): we use the Bank of England quarterly average spot exchange rate for Sterling against the US$, 1985 (Q1) to 2008 (Q3).[18] We selected this dataset because the US$ is the unofficial reserve currency of the international financial system and represents the most significant traded currency on international markets for the period under analysis (despite that there has also been diversification into holdings in other currencies, including new currencies, such as the Euro). Spot rates are those observed (to be executed 2 days hence) by the Bank of England's Foreign Exchange Desk in the London interbank market at 4 pm each day.[19] They provide an authoritative but not official guide to the exchange rate and its movements. The exchange rate is widely recognized to be of potential significance in terms of (in)stability because movements can signal capital flight and repatriation but also because stable exchange rates are a desirable condition for trade and investment (see Malikane and Semmler 2008; Khorasgani 2010).
- Deficit to GDP Ratio (DGDPR hereafter): we use the Office of National Statistics quarterly data for Public Sector current budget deficit/surplus as a % of GDP (rolling 4 quarter average), 1985 (Q1) to 2008 (Q3). [20] Following Muscatelli et al. (2004) we selected this dataset as a deficit to income ratio, rather than selecting a debt to income ratio, because it provides an ongoing snapshot of the prevailing shortfall or surplus in government finances, rather than a cumulative expression of past debt. As such, it provides an indication of the potential for proximate financial distress or its absence in recent events. This then is significant for issues of (in)stability.
- Gross Domestic Product Growth Rate (GDPG hereafter): we use the Office of National Statistics quarterly data for Gross Domestic Product at current market prices, 1985 (Q1) to 2008 (Q3).[21] We selected this dataset because it is adjusted for inflation and represents real economic growth. GDP is a primary point of reference for all other indicators of economic and financial stability in terms of the business cycle. In what follows its main significance is as a dependent variable.

4. Econometric model and data analysis

[18] The dataset is available at: http://www.bankofengland.co.uk/boeapps/iadb/index.asp?Travel=NIxIRx&levels=1&XNotes=Y&C=DLM&G0Xtop.x=17&G0Xtop.y=6&FNotes2=Y&XNotes2=Y&Nodes=X3790X3791X3873X33940X3836&SectionRequired=I&HideNums=-1&ExtraInfo=true#BM

[19] Note: it is not an inconsistency to use forward data for bond yields and spot data for exchange rates, since we are interested in different relations in terms of each. Expectations regarding yield are a significant factor for decision making in terms of bond purchases, whilst this is not a core issue for currencies, hence spot data is appropriate.

[20] The dataset is available at: http://www.ons.gov.uk/ons/datasets-and-tables/data-selector.html?cdid=J4DE&dataset=pusf&table-id=PSF9

[21] The dataset is available at: http://www.ons.gov.uk/ons/datasets-and-tables/data-selector.html?cdid=KGX4&dataset=pn2&table-id=C1

The objective of this study is to explore aspects of 'six-pillars' of financial stability in the United Kingdom, based on a data set for the period 1985 (Q1) to 2008 (Q3). The dataset includes multiple variables and a time series. Vector Auto Regressive (VAR) models are widely used for such datasets (see Basu and Michailidis 2013). VAR is used with interrelated time series and for analyzing the dynamic impact of random disturbances on the system of variables. In a VAR model the endogenous and explanatory variables interact simultaneously, hence there is an extended information set, which makes it a more adequate presentation of key aspects of an economic system than a standard multiple regression model (Pecican 2010). The VAR approach sidesteps the need for structural modeling by modeling every endogenous variable in the system as a function of the lagged values of all of the endogenous variables in the system. Since only lagged values of the endogenous variables appear on the right-hand side of each equation there is no issue of simultaneity. Importantly, the assumption that any disturbances are not serially correlated is not restrictive, because any serial correlation could be absorbed by adding more lagged *y*'s. As such, using VAR, any serial correlation of errors does not become an issue.
Having chosen a VAR approach, in order to establish whether the data is stationary we first apply a unit root test (augmented Dickey & Fuller test; Section 4.1). Stationarity is important to establish because in its absence a drift in the data series would yield potentially spurious results, undermining the model and placing any association between the given variables in question. One is then required to distinguish whether an unstructured or simple VAR or a restricted or vector error correction model (VECM) is appropriate (Section 4.2). VECM is the appropriate model when co-integration exists among the variables. As such, we perform a Johansen Co-integration test in order to establish that co-integration pertains (Section 4.3). Based on the findings we then run a VECM. Since our objective is to test the possible associations of the 6 pillars of financial stability with economic stability (represented by real GDP) and then, given the historical/theoretical emphasis placed upon it, price stability (represented by the RPI), we present a reduced form of the full VEC model, which specifies only 2 equations, based on the foci (Section 4.4). These results are then separately explored (Sections 4.5 & 4.6). The estimations of parameters are then tested for robustness using three standard diagnostic tests: heteroskedacity (White), autocorrelation (Breusch-Godfrey Serial Correlation LM) and Exogeneity (Wald) (Sections 4.51 & 4.61).

The empirical results obtained from the VEC Model provide some insight regarding economic stability but also involve an inherent limitation.[22] Growth may respond differently to the dynamics of any given variable, e.g. equity prices, from period to period. If one simply estimates parameters within the VEC for each of the lagged periods then one will obtain a range of coefficients (different for each quarter; potentially ranging in terms of sign, size and significance). Here, the results are difficult to interpret in terms of an overall responsiveness of the dependent variable to the explanatory variables. An Impulse Response Function (IRF) analysis allows us to address this issue (Canova 2007, 130; Sections 4.52 & 4.62).

The IRFs are obtained from the Moving Average (MA) representation of the original VAR model. The IRFs are the dynamic response of each endogenous variable to a one-period standard deviation shock to the system. The responsiveness of the dependent variables in the VAR to

[22] So one arising issue is that multiple lags in the independent or explanatory variables prohibit a complete picture of the associations amongst the said variables.

shocks on each variable is revealed by the impulse responses. So, for each variable from each equation separately, a unit shock is applied to the error, and the effects upon the VAR system over time are noted (Brooks 2008). In other words, a shock to the *ith* variable directly affects the *ith* variable and in addition, is transmitted to the other endogenous variables through the dynamic lag structure of the VAR. In this sense, an IRF traces out the effects of a onetime shock to one of the innovations of the current and future values of the endogenous variables.

4.1 *Unit Root Test*

In the event that a variable has unit roots, first and subsequent differencing renders them stationary (Greene 2012). The common practice recommended by Engle and Granger (1987) is the use of an Augmented Dickey-Fuller (ADF) test for unit roots. We applied this to the dataset and the results are presented in Table 1.

<Insert Table 1 around here>

As indicated in Table 1, after taking the first difference, the results were greater than the critical values at a 5% significance level, which implies that all the data series were first difference stationary or I(1) variables. As such, stationarity was established.

4.2 *The VAR Model*

Since we have selected a VAR approach, no major methodological issues for estimation arise regarding the order in which variables are presented (Brooks 2008). The next procedure is to establish the most appropriate number of lags for the explanatory variables within the dataset. In order to do so, we performed an optimal lag selection test using a range of standard criteria, rather than one only. These are set out in Table 2.

<Insert Table 2 around here>

As one can see, the SC and HQ criteria indicate one as an optimal lag, whilst the LR and FPE criteria indicate five as the optimal lag, and the AIC criterion indicates six as the optimal lag. For our purposes we choose the AIC criterion and so six as the optimal lag. Here, we follow Liew (2004). Our dataset is for quarters and constitutes 95 observations and this is relatively small. Liew makes the case that AIC is appropriate for small samples. Moreover, AIC minimizes the possibility of underestimation of the optimal lag length whilst improving the potential that the true lag length is recovered.

4.3 *Johansen Co-integration test*

In order to distinguish whether an unstructured or simple VAR or a restricted or vector error correction model (VECM) is appropriate we use the Johansen Co-integration test. We use this method rather than the Engle-Granger test because unlike the Engle-Granger test it allows more than one co-integrating relationship (Greene 2012). Since we have six variables there could be more than one such relationship. The results of the Johansen test are presented in Table 3:

Table 3 Johansen Co-integration Test

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None	0.557	220.580	125.615	0.000
At most 1*	0.424	149.825	95.754	0.000
At most 2*	0.329	101.882	69.819	0.000
At most 3*	0.292	67.118	47.856	0.000
At most 4*	0.219	37.035	29.797	0.006
At most 5*	0.156	15.579	15.495	0.049
At most 6	0.009	0.817	3.841	0.366
Unrestricted Co-integration Rank Test (Maximum Eigen value)				
Hypothesized No. of CE(s)	**Eigen value**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None	0.557	70.754	46.231	0.000
At most 1*	0.424	47.944	40.078	0.005
At most 2*	0.329	34.764	33.877	0.039
At most 3*	0.292	30.083	27.584	0.023
At most 4*	0.219	21.456	21.132	0.045
At most 5*	0.156	14.762	14.265	0.042
At most 6	0.009	0.817	3.841	0.366

*Hypothesis of no co-integration was rejected by Trace & Max Eigen value test. ** MacKinnon-Haug-Michelis (1999) p-values.

As Table 3 indicates both of the Unrestricted Co-integration Rank tests (Trace & Max Eigen statistics) show that the null of no co-integration was rejected at the 5% level of significance on the basis of MacKinnon-Haug-Michelis (1999) p-values. As such, the results of our co-integration test show that there is a co-integrating relationship among the variables, based on 6 lag periods. Since co-integration is established we then opt for a vector error correction model (VECM) for our analysis of the six pillars of financial stability for the dataset.[23]

4.4 *The VEC Model*

In a VAR model the endogenous and explanatory variables interact simultaneously creating an extended information set. A Vector Error Correction (VEC) model allows for co-integration. Thereafter, a basic feature of a VEC model is that it includes an error correction term (U_{t-1}), which is a one period lag residual term that provides also reversion to the mean. In our case, this allows one to explore the association between the six pillars of financial stability and any designated response variable, in so far as the reversion restores the system to a state of long run equilibrium. Since the full model has seven variables seven equations can be specified, where in the system of equations any of the seven variables could be dependent. These can be considered as a nexus of relationships. However, we are only interested in some aspects of this nexus. Specifically we have identified 6 aggregates as pillars of financial stability. Thereafter our objective is to test the possible associations of these 6 with economic stability (represented by real GDP) and then, given the historical/theoretical emphasis placed upon it, price stability (represented by the CPI). As such, we present a reduced form of the full model, which specifies

[23] Note: Elliott (1998) highlights the robustness of co-integration methods when series are very close to unit root and finds that hypothesis tests are unaffected by the presence of near unit root variables not included in the restrictions.

only 2 equations. In equation (1) GDP appears on the left as the response variable and in equation (2) inflation appears on the left as the response variable:

Y_t (GDPG) = U_{t-1} + ß Y_{t-i} (GDPG) + ßY_{t-i} (SMR) + ßX_{t-i} (SER) + ß X_{t-i}(INF) + ßX_{t-i} (DL) + ßX_{t-i}

(DGDPR) + ßX_{t-i} (BMY) + Constant + et (1)

Y_t (INF) = U_{t-1} + ß Y_{t-i} (INF) +ßY_{t-i}(SMR) + ßX_{t-i} (SER) + ß X_{t-i}(GDPG) + ßX_{t-i} (DL) + ßX_{t-i}

(DGDPR) + ßX_{t-i} (BMY) + Constant + et (2)

The symbols follow the nomenclature set out in §3; in addition, Y_t and X_t refer to the (n x 1) vector of time series endogenous variables, ß$_i$ refers to the (n x n) coefficient matrixes and *et* refers to the (n x 1) white noise or unobservable vector process (assuming an absence of autocorrelation and the existence of an independent distribution i.e. et ˜ N (0, σ2).

4.5 *Results for VEC Equation (1); economic stability*

In a VEC model, the coefficients of the error correction term contain information about whether the past values affect the current values of the variable under study. A significant coefficient implies that past equilibrium errors play a role in determining the current outcomes. The information obtained from the error correction model is related to the speed of adjustment of the system *towards* long-run equilibrium. The short-run dynamics are captured through the individual coefficients of the difference terms.

The results are presented in Table 4: the adjustment coefficient on the error correction term from Equation (1) is negative and statistically significant at the 5% level of significance. This indicates that when deviating from the long-term equilibrium the error correction term has an opposite adjustment effect and the degree of deviation are reduced. In the model there are six independent variables (representing aspects of financial stability) and a further dependent variable (economic growth). The important point to highlight here is that the significant error term supports the existence of a long-term relationship between financial stability and economic growth. The R-squared statistic for the model following equation (1) is 87%. This indicates the strength of the model in the long-run and underpins the significance of independent variables and their lagged effect.

Table 4 Vector Error Correction Model (VECM): Equation (1)

Variables	Coefficient	Std. Error	t-Statistic	Prob.
***U* t-1**	0.001	0.001	1.085	0.285
***U* t-1**	-11.378	3.200	-3.556	0.001
***U* t-1**	-0.137	0.047	-2.938	0.006
***U* t-1**	-0.831	0.354	-2.348	0.024
***U* t-1**	0.040	0.027	1.514	0.138
***U* t-1**	-0.308	0.270	-1.141	0.261
SMR	0.000	0.001	-0.575	0.568
SMR	0.000	0.001	-0.257	0.799
SMR	0.000	0.001	0.644	0.523
SMR	0.000	0.000	-0.812	0.422
SMR	0.000	0.000	0.081	0.936
SMR	0.001	0.000	2.711	0.010
SER	9.130	3.135	2.912	0.006
SER	10.349	2.814	3.678	0.001
SER	8.494	2.386	3.560	0.001
SER	2.137	2.370	0.902	0.373
SER	4.217	1.864	2.262	0.030
SER	2.067	1.659	1.246	0.220
INF	0.107	0.045	2.381	0.022
INF	0.024	0.048	0.500	0.620
INF	0.022	0.038	0.569	0.572
INF	0.031	0.032	0.962	0.342
INF	0.030	0.032	0.924	0.361
INF	0.047	0.038	1.233	0.225
GDPG	0.216	0.344	0.629	0.533
GDPG	0.232	0.305	0.759	0.453
GDPG	0.098	0.230	0.425	0.673
GDPG	-0.157	0.217	-0.725	0.473
GDPG	0.029	0.191	0.152	0.880
GDPG	0.188	0.159	1.184	0.244
DL	0.448	0.186	2.415	0.021
DL	0.572	0.208	2.753	0.009
DL	-0.304	0.135	-2.260	0.030
DL	-0.061	0.138	-0.440	0.663
DL	0.021	0.131	0.158	0.876
DL	-0.088	0.128	-0.686	0.497
DGDPR	-0.380	0.408	-0.931	0.358
DGDPR	0.473	0.416	1.137	0.263
DGDPR	0.088	0.391	0.226	0.823
DGDPR	-0.586	0.356	-1.644	0.108
DGDPR	0.067	0.360	0.186	0.853
DGDPR	-0.017	0.373	-0.046	0.964
BMY	-2.161	0.874	-2.471	0.018
BMY	-2.007	0.704	-2.851	0.007
BMY	-2.107	0.637	-3.306	0.002
BMY	-1.074	0.621	-1.729	0.092
BMY	-0.855	0.523	-1.635	0.110
BMY	-1.040	0.479	-2.170	0.036
Constant	-2.659	0.876	-3.036	0.004

*Estimation Using Ordinary Least Square (OLS) method

Clearly, then, our findings tend to support more specific findings, claims and analyses that suggest that financial stability is a key component in long term economic stability;[24] given that price stability cannot guarantee financial stability it then follows that, a focus on price stability alone will tend to create the potential for issues to arise in various aspects of finance that can then pose problems for economic stability (see White 2006; Borio and White 2004). These are more than threshold issues in the Reinhart and Rogoff (2009) sense since the actual mechanisms contributing to the manifestation of crisis are likely in some sense to be operative prior to that threshold. For further analysis see the results of the Impulse Response Function in Section 4.52.

4.51 *Diagnostic tests for Equation (1)*

To check the robustness of our model against issues of heteroskedasticity, autocorrelation and exogeneity, we performed a series of diagnostic tests. The results are shown in Table 5:

Table 5 Diagnostic Test (Heteroskedasticity, Autocorrelation & Exogeneity)

Heteroskedasticity : White Test	**Test Stat**		**P value**
Obs. R-Squared	35.400	Prob. Chi-Square (48)	0.911
Breusch-Godfrey Serial Correlation LM test			
Obs. R-squared	5.867	Prob. Chi-Square(2)	0.053
Block Exogenity Wald test			
D(SMR)	18.567	df-6	0.005
D(SER)	22.109	df-6	0.001
D(INF)	12.735	df-6	0.047
D(DL)	37.723	df-6	0.000
D(DGDPR)	5.742	df-6	0.453
D(BMY)	13.323	df-6	0.038
All	82.715	df-6	0.000

*Significant at 1% level, ** Significant at 5% level

As presented in Table 5, the diagnostic test results show that the null of Homoskedasticity (White Test) and null of no serial correlation (BG test) could not be rejected at 5% level of significance, which implies that the model and results are non-spurious. In addition, with the exception of sovereign debt (DGDPR), the variables showed an exogenous association with economic growth (GDPG) at the 5% level of significance. Interestingly, on the whole all financial aggregates (see final row) were significantly exogenous to economic growth.

In a VEC model with lags there are some coefficients that are statistically insignificant. A Wald test was performed in order to ascertain whether the various explanatory variables and their coefficients jointly influence response variables. The results are shown in Table 6:

[24] See also No these three references on the list. You need add them. Beck et al. (2005), Kunt et al. (2004), and Guiso et al. (2007); each suggests that through its effect on the allocation of financial resources, the quality of bank regulation and supervision may have dramatic effects on economic growth.

Table 6 Wald Test: Error Correction Model

Test Statistic	Value	df	Probability
SMR			
F-statistic	3.094	(6, 38)	0.014*
Chi-square	18.566	6	0.005*
SER			
F-statistic	3.684	(6,38)	0.006*
Chi-square	22.109	6	0.001*
INF			
F-statistic	2.122	(6,38)	0.073
Chi-square	12.735	6	0.047*
DGDPG			
F-statistic	1.521	(6,38)	0.197
Chi-square	9.130	6	0.166
DL			
F-statistic	6,287	(6,38)	0.000*
Chi-square	37,723	6	0.000*
DGDPR			
F-statistic	0.956	(6,38)	0.467
Chi-square	5.741	6	0.452
BMY			
F-statistic	2.220	(6,38)	0.062
Chi-square	13,322	6	0.038*

*Significant at 1% level, ** Significant at 5% level

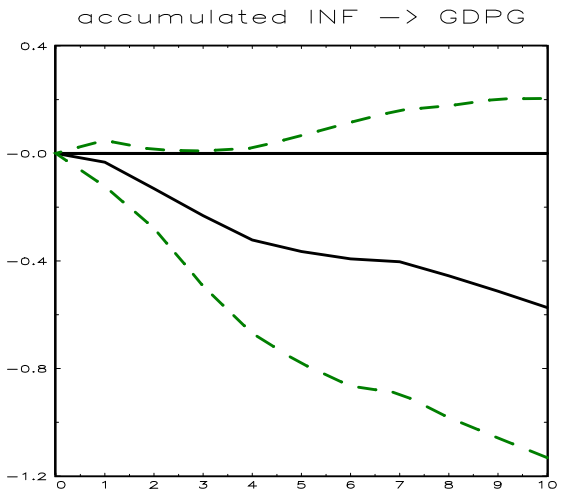
As presented in Table 6, all explanatory variables showed an overall significant association with economic growth (GDPG), except sovereign debt (DGDPR), which did not meet the 5% level of significance benchmark.

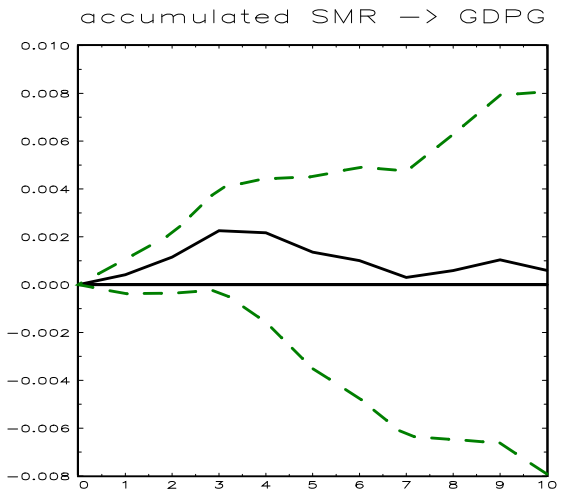
4.52 *Impulse Response Function & Data Analysis for Equation (1)*

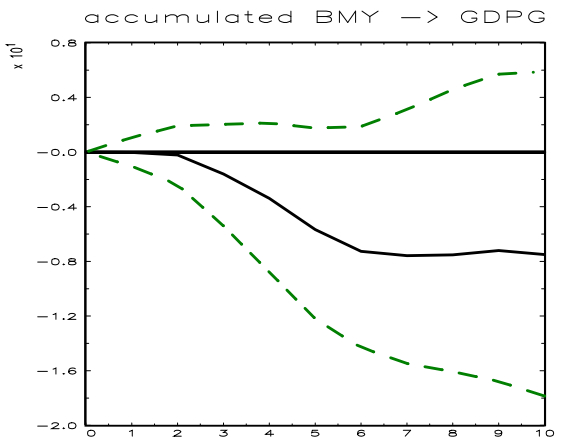
As previously noted, the empirical results obtained from the VEC Model and presented in Section 4.5 Table 4 provide some insight regarding economic stability but also involve an inherent limitation. To address this we provide an Impulse Response Function (IRF) analysis. We set out an IRF for the response of GDP growth (GDPG) to a one standard deviation shock in each of the 6 separate financial pillars. The findings are presented in Figure 1:

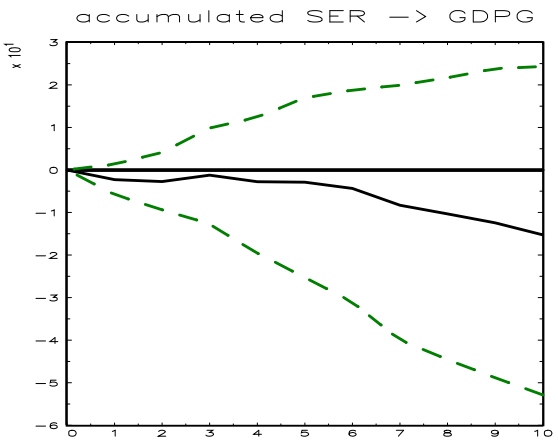
It is worth mentioning here that as we are using a VEC Model with error correction terms, hence there are no confidence bands around impulse line. This is due to the reason that the error correction term brings the system to the long term equilibrium and there is no uncertainty around the mean. Hence, there are no logical grounds for confidence interval bands. However to overcome this issue, we adopted a fairly common and established practice in literature and used bootstrapping by employing the Efron Percentile Confidence Interval[25] and one thousands bootstrap replications were performed (B = 1000).

[25] We used JMulti-4 software package for bootstrapping, for details on the bootstrapping method and its rationale please see Efron and Tibshirani (1993).


accumulated INF —> GDPG
0.4
−0.0
−0.4
−0.8
−1.2
0 1 2 3 4 5 6 7 8 9 10


accumulated SMR —> GDPG
0.010
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008
0 1 2 3 4 5 6 7 8 9 10


accumulated BMY —> GDPG
x 10⁻¹
0.8
0.4
−0.0
−0.4
−0.8
−1.2
−1.6
−2.0
0 1 2 3 4 5 6 7 8 9 10


accumulated SER —> GDPG
x 10⁻¹
3
2
1
0
−1
−2
−3
−4
−5
−6
0 1 2 3 4 5 6 7 8 9 10

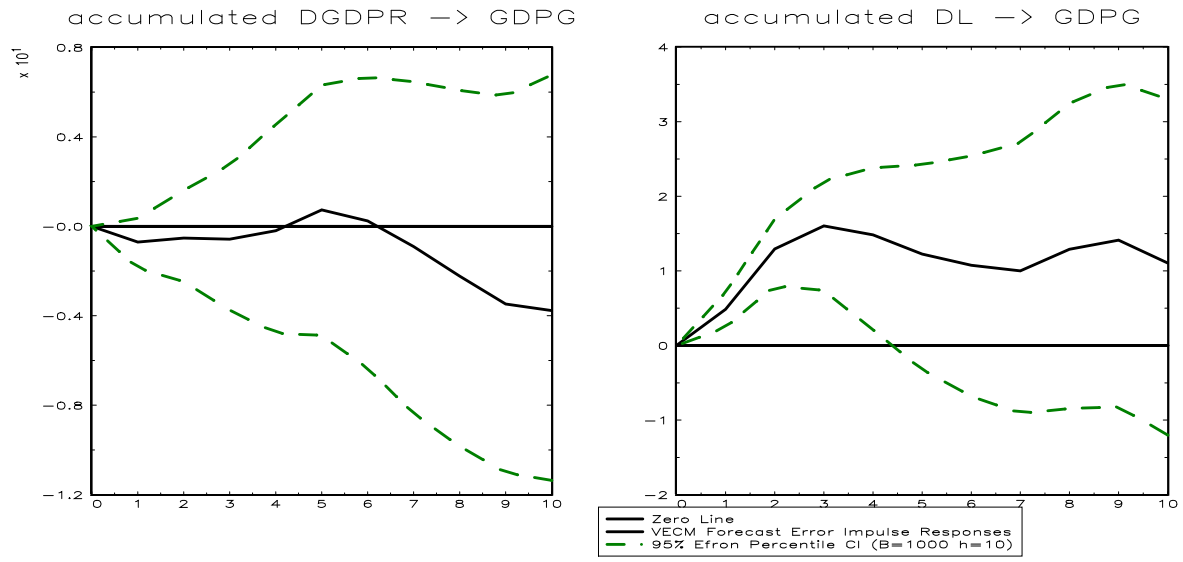


Figure1 Impulse Response Function: Economic Growth and Financial Stability

Accumulated Response to Cholesky One S.D. Innovations

Our key findings for the UK based on the dataset include:

1. A one standard deviation shock to the stock market (SMR) leads to an increase in economic growth (GDPG) that persisted for more than 8 quarters. This indicates a strong association between the stock market and the real economy in a non-crisis regime situation. One can then infer a strong impact in terms of a wealth effect here.
2. A one standard deviation shock to the exchange rate (SER) results in a relatively minor immediate positive impact on economic growth (GDPG), followed by a subsequent more pronounced and increasing negative impact. Here, one can draw the inference that exchange rate appreciation may not provide for long-term real economic growth. This can be based on a variety of actual mechanisms. For example, where exports of goods are adversely affected (expressed in the balance of trade) to a degree that is not offset by the balance on invisibles.
3. A one standard deviation shock to inflation leads to a continuous and increasing negative impact on real economic growth (GDPG). This seems to support the generally recognized claim that inflation does not contribute to real economic growth and one can also draw the inference that price stability, though clearly not sufficient for economic stability, is an extremely important constituent of a situation that contributes to such stability.
4. A one standard deviation shock (a pricing decrease) to the bond market yield (BMY) results in a negative impact on real economic growth that begins to manifest after 3 quarters and this is indicative of both the sensitivity of the economy to yields and a significant lag in transitional effects from financial markets to the real sector.
5. A one standard deviation shock to domestic lending (DL) provides a positive impact on real economic growth, and this persists for several quarters. This confirms the generally

recognised positive role of credit creation within a non-crisis regime. This, of course, does not militate against adverse movements in absolute scales of debt, leverage and terms of credit that can accumulate during non-crisis periods and which may undermine the very conditions of financial and economic stability.

6. A one standard deviation shock to the sovereign debt level in comparison to national income (DGDPR) provides no immediate significant positive impact on real economic growth but does result in a delayed yet persistent negative impact after the eighth quarter. This may be related to the way in which public expenditure is used (since the actual context is productive capital investment versus more limited forms of welfare payments with different consequences and possible multipliers).

4.6 *Results for VEC Equation (2); price stability*

The second aspect of economic stability we are considering is price stability and its association with financial stability. The results for VEC Equation (2) are presented in Table 7:

In Table 7, the adjustment coefficient on the error correction term for Equation (2) is positive and not statistically significant at the 5% level of significance. The term is also relatively small and so the error correction function is not tending to restore equilibrium, implying that there will be disruption to equilibrium in the long-run. However, we might expect other external factors, not accounted for in the model, to help maintain the long-run equilibrium. The R-squared statistic for Equation (2) is 83% and this indicates the strength of the model in the long-run and underpins the significance of independent variables and their lagged effect. For further analysis see the results of the Impulse Response Function in Section 4.62.

Table 7 Vector Error Correction Model (VECM): Equation (2)

Variables	Coefficient	Std. Error	t-Statistic	Prob.
***U* t-1**	0.003	0.003	1.095	0.281
***U* t-1**	11.773	12.310	0.956	0.345
***U* t-1**	-0.293	0.180	-1.630	0.111
***U* t-1**	-2.932	1.361	-2.154	0.038
***U* t-1**	0.189	0.103	1.841	0.073
***U* t-1**	-0.306	1.040	-0.294	0.770
SMR	-0.002	0.003	-0.571	0.572
SMR	-0.002	0.003	-0.878	0.386
SMR	-0.001	0.002	-0.362	0.720
SMR	0.002	0.002	1.087	0.284
SMR	0.000	0.002	0.182	0.857
SMR	-0.001	0.001	-0.358	0.722
SER	-6.250	12.060	-0.518	0.607
SER	-4.212	10.823	-0.389	0.699
SER	-18.580	9.179	-2.024	0.050
SER	-5.856	9.117	-0.642	0.525
SER	-2.008	7.170	-0.280	0.781
SER	-7.867	6.380	-1.233	0.225
INF	0.090	0.173	0.522	0.605
INF	-0.006	0.185	-0.030	0.976
INF	-0.362	0.146	-2.473	0.018
INF	0.244	0.123	1.988	0.054
INF	-0.508	0.124	-4.115	0.000
INF	-0.436	0.146	-2.998	0.005
GDPG	2.433	1.322	1.840	0.074
GDPG	0.244	1.174	0.208	0.836
GDPG	0.181	0.886	0.205	0.839
GDPG	0.404	0.835	0.484	0.631
GDPG	-0.117	0.734	-0.159	0.874
GDPG	0.092	0.613	0.151	0.881
DL	-0.445	0.714	-0.623	0.537
DL	-0.101	0.799	-0.127	0.900
DL	0.994	0.518	1.920	0.062
DL	0.104	0.531	0.197	0.845
DL	-0.558	0.504	-1.107	0.275
DL	-0.379	0.491	-0.771	0.446
DGDPR	1.519	1.568	0.968	0.339
DGDPR	-1.666	1.600	-1.041	0.304
DGDPR	-1.420	1.504	-0.944	0.351
DGDPR	-0.078	1.370	-0.057	0.955
DGDPR	1.063	1.385	0.767	0.448
DGDPR	-2.079	1.436	-1.448	0.156
BMY	-3.765	3.364	-1.119	0.270
BMY	-0.212	2.708	-0.078	0.938
BMY	1.610	2.451	0.657	0.515
BMY	-0.599	2.390	-0.251	0.803
BMY	-0.506	2.012	-0.252	0.803
BMY	0.150	1.843	0.081	0.936
Constant	10.714	3.369	3.180	0.003

*Estimation Using Ordinary Least Square (OLS) method

4.61 *Diagnostic tests for Equation (2)*

As with Equation (1), in order to check the robustness of our model against issues of heteroskedasticity, autocorrelation and exogeneity, we performed a series of diagnostic tests. The results are shown in Table 8:

Table 8 Diagnostic Test (Heteroskedasticity, Autocorrelation & Exogeneity)

Heteroskedasticity : White Test	**Test Stat**		**P value**
Obs. R-Squared	48.763	Prob. Chi-Square (48)	0.449
Breusch-Godfrey Serial Correlation LM test			
Obs. R-squared	13.927	Prob. Chi-Square(2)	0.001
Block Exogenity Wald test			
D(SMR)	6.389	df-6	0.381
D(SER)	8.454	df-6	0.207
D(GDPG)	18.766	df-6	0.005
D(DL)	8.484	df-6	0.205
D(DGDPR)	4.923	df-6	0.554
D(BMY)	7.123	df-6	0.310
All	80.520	df-6	0.000

*Significant at 1% level, ** Significant at 5% level

As presented in Table 8, the diagnostic test results show that the null of Homoskedasticity (White test) was accepted while the null of no serial correlation (BG test) was rejected at the 5% level of significance. Though the model and results may be deemed non-spurious, we have signs of serial correlation, which is often the case with financial observations. With the exception of economic growth (GDPG) the variables did not show significant exogenous association with Inflation (INF) at the 5% level of significance. Interestingly, on the whole all (see final row) financial aggregates were significantly exogenous to price stability.

As with Equation (1) a Wald test was performed in order to ascertain whether the various explanatory variables and their coefficients jointly influence response variables. The results are shown in Table 9:

Table 9 Wald Test: Error Correction Model

Test Statistic	Value	df	Probability
SMR			
F-statistic	1.064	(6, 38)	0.400
Chi-square	6.388	6	0.3811
SER			
F-statistic	1.409	(6,38)	0.236
Chi-square	8.454	6	0.206
INF			
F-statistic	8.216	(6,38)	0.000*
Chi-square	29.301	6	0.000*
DGDPG			
F-statistic	3.127	(6,38)	0.013*
Chi-square	18.765	6	0.004*
DL			
F-statistic	1.413	(6,38)	0.234
Chi-square	8.483	6	0.204
DGDPR			
F-statistic	0.820	(6,38)	0.561
Chi-square	4.923	6	0.553
BMY			
F-statistic	7.122	(6,38)	0.333
Chi-square	7.122	6	0.309

*Significant at 1% level, ** Significant at 5% level

As presented in Table 9, none of the explanatory variables showed an overall significant association with inflation (INF), except economic growth (DGDPG), which did meet the 5% level of significance benchmark. This allows us to infer that among the six pillars of financial stability, economic growth may have a stronger association with price stability than with the other specified financial sector aggregates.

4.62 *Impulse Response Function & Data Analysis for Equation (2)*

Following the format of Section 4.52, we set out an Impulse Response Function (IRF) for the response of price stability (INF) to a one standard deviation shock in each of the 6 separate financial pillars. The bootstrapping was performed to construct the confidence interval by employing Efron Percentile Confidence Interval method. One thousands bootstrap replications were carried out (B = 1000). The findings are presented in Figure 2:

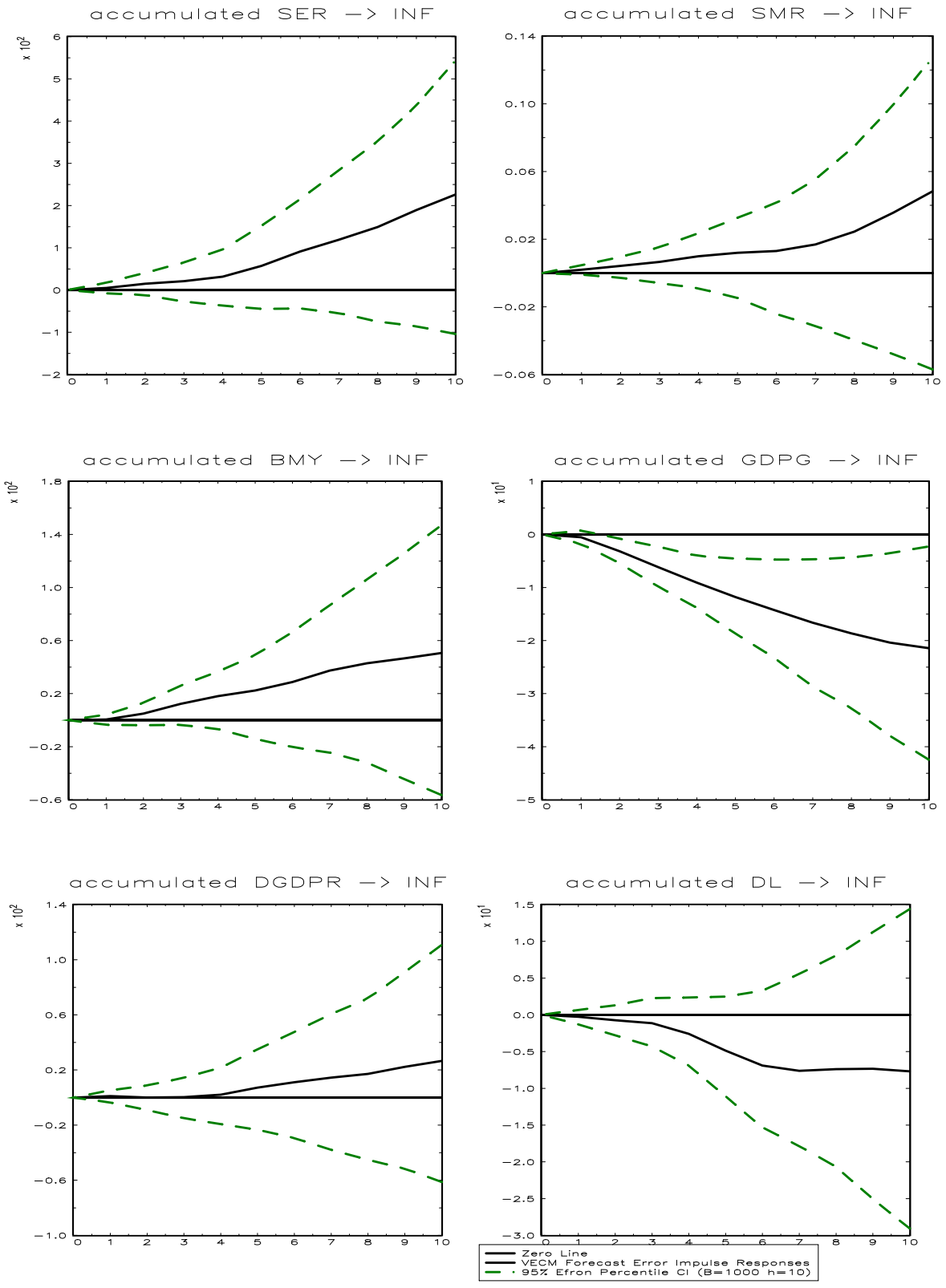

accumulated SER —> INF
x 10^2
accumulated SMR —> INF
accumulated BMY —> INF
x 10^2
accumulated GDPG —> INF
x 10^1
accumulated DGDPR —> INF
x 10^2
accumulated DL —> INF
x 10^1
Zero Line
VECM Forecast Error Impulse Responses
95% Efron Percentile CI (B=1000 h=10)

Figure 2 Impulse Response Function: Price Stability and Financial Stability
Accumulated Response to Cholesky One S.D. Innovations

Our key findings for the UK based on the dataset include:

1. If we refer to Figures 2a (the stock market) and 2b (the exchange rate), in both cases a one standard deviation shock is associated with a slow and persistent increase in inflation. This finding accords with the general economic insight that exchange rate appreciation affects purchasing power and so the basis of consumption, and that financial assets and instruments can provide hedges against inflation and so such assets rise in relation to other sources of price pressures (and in terms of trade-offs with capital flows to bond markets).
2. If we refer to Figure 2c (the bond market, BMY), a one standard deviation shock is also associated with a general and persistent increase in inflation. This finding is of great interest because it implies many potential points of linkage between sovereign debt activity and general price levels. Rising inflation may imply a demand amongst bond investors for higher rates of nominal return on assets in order to recover real rates. Conversely, the government may be involved in tacitly encouraging a degree of inflation to reduce its long term debt burden based on historic accumulation of treasuries. It may also be that as the government's cost of borrowing increases, taxation (perhaps in regressive stealth forms) also increases resulting in the possibility for an additional price pressure.
3. If we refer to Figure 2d (real economic growth, GDPG) a one standard deviation shock leads to a decrease in inflation. This, of course, is conditional on appropriate relations to output capacity, based also on investment, productivity and wage growth.
4. Finally, if we refer to Figures 2e (domestic lending, DL) and 2f (the sovereign debt level, DGDPR)[26] a one standard deviation shock leads to divergent persistent effects on inflation between the cases. It appears curious that rising domestic lending is not clearly associated with rising prices, whilst sovereign debt does appear to be. Intuitively domestic lending is associated with consumption and also with asset appreciation in given markets, it then seems worthy of additional research to explore the relations at work here. This, however, is beyond the scope of our paper.

What we want to emphasize here is that the complexity of economic relations implies that price stability is always under pressure within a non-crisis regime. This implies that in addition to the point that one cannot assume that price stability will be sufficient for financial stability, one also can neither simply assume the continuation of price stability nor that financial stability will persist in a way that does not undermine price stability. All these points tend to indicate there is a role for state oversight and intervention within a non-crisis regime based on the complexity of possible interactions that may undermine financial stability and price stability, with consequences for their association with economic growth.

5. Conclusion: policy implications

[26] Recalling we selected this variable as a deficit to income ratio, rather than selecting a debt to income ratio, because it provides an ongoing snapshot of the prevailing shortfall or surplus in government finances, rather than a cumulative expression of past debt. As such, it provides an indication of the potential for proximate financial distress or its absence in recent events.

In this paper we have pursued an empirical exploration of 6 pillars of financial stability, based on a dataset for the UK extending from 1985 (Q1) to 2008 (Q2). We have done so through the construction of a vector error correction model, including an Impulse Response Function. The purpose of this paper has been to provide a different context for considering issues of financial stability and instability, with reference to economic growth and price stability in particular. This context is more inclusive than the received approach of researchers such as Reinhart and Rogoff (2009), which creates an inadvertent focus on crisis thresholds. Our model has allowed us to test aspects of financial stability against economic and price stability in a non-crisis situation. Our findings should be considered in the context of a concept of the economy as fundamentally dynamic and subject to complex cumulative processes. Whilst we focus on a non-crisis situation in terms of our dataset, we are aware that what occurs in such a situation contributes to any subsequent crisis period. As such, though one can define and distinguish stability and instability (as we have done), the distinction is one that involves some interface ambiguity as well as contingency. This ambiguity, however, far from providing an argument against implications for policy tends rather to provide support for cautionary and prudential approaches.

In so far as there is an association between economic growth, financial and price stability and in so far as financial instability creates adverse effects then we would argue our findings provide one justification (among many others)[27] for macro-prudential approaches to the finance system (see White 2009; Tsunama 2009; Mishkin 2011). It is no longer tenable to argue that particular asset bubbles cannot be identified prior to their collapse, nor that it is simply more expedient to allow them to collapse and deal with the damage thereafter. A modern economy has multiple points of connection and any given asset appreciation phenomena may be related to or have consequences for other aspects of an economy (finance and risk dispersion can quickly become damaging contagion). This is being increasingly recognized. For example, it is explicitly stated in the new organizational architecture of the Bank of England through the Financial Services Act of 2012 and the creation of the Financial Policy Committee, whose new remit is expressly stated as macro-prudential (Osborne 2013). The specific form that this remit will then manifest in is yet to be set, macro-prudential policy is an evolving issue. However, it clearly makes sense to provide for oversight and regulation that begins from the potential problems that may arise in non-crisis periods and to consider these based on particular sets of associations that can then be explored in more detail. We have made a start here in identifying some of these.

Acknowledgment

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[27] For example, Caruana (2010) claims that the global financial crisis has provided a deeper insight into the role central banks can and should play in encouraging financial system stability; Giannone et al. (2011) demonstrate that the quality of bank regulation helps to account for the scale of damages triggered by a financial crisis.

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Appendix

Biannual Systemic Risk Survey