

# The association between aggregated and disaggregated stock prices with monetary policy using asymmetric cointegration and error-correction modeling approaches

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## Abstract

This paper analyzes the association between monetary policy (measured by short-term interest rate) and stock prices at the aggregate and disaggregated levels for Malaysia using asymmetric cointegration and error-correction modeling approaches. Estimating the models using monthly data from 1986:1 to 2012:12, results show with the exception of the finance, plantation and consumer products sectors, there is evidences supportive of the long-run relations between monetary policy and stock prices. Further, the aggregate, industrial and properties stock price indices are noted to be asymmetrically cointegrated with monetary policy with the faster adjustment of stock prices when they are below their long-run values.

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*JEL classification:* E52; G10; C22

*Keywords:* Monetary policy; Stock prices; Asymmetric cointegration; Disaggregated analysis

## 1. Introduction

Monetary policy is widely believed to have a significant impact on asset prices. The classical theory of asset prices describes the price of an asset as being equals to the present value of expected income from the asset. Accordingly, stock price represents the discounted present value of the firm's future cash flows. Monetary policy decisions, closely associated with changes in various short-term interest rates, are then expected to affect stock prices by adjusting the discount rate. Lobo (2000) argued that interest rate changes can also impact asset prices by altering expectations of future cash flows as a result of changing expectations about future inflation in the economy. Mishkin (1996) elaborated two views through which monetary policy can influence stock prices: the monetarist view and the Keynesian view. From the monetarist view, expansionary monetary policies increase the optimum money balances and hence enhance the demand for equities and raising their prices. Keynesians argue

that the fall in interest rates stemming from expansionary monetary policies making bonds less attractive than equities causing the price of equities to rise.

The relationship between monetary policy and stock prices has been of great interest to both monetary policymakers and financial markets participants. It is an important step in implementing effective policy decisions and formulating successful investment and risk management decisions. It is also important for understanding the monetary policy transmission mechanism. The Tobin's  $q$  theory of investment and the wealth effects are two important channels involving stock prices in transmitting the effects of monetary policy to its ultimate objectives. In the last few years, an increasing number of empirical studies have investigated the impact of monetary policy on stock prices and returns by employing different methodologies ranging from VAR models (Cassola and Morana, 2004; Ewing et al., 1998, 2003; Thorbecke, 1997) to event study approaches (Bernanke and Kuttner, 2005; Chulia et al., 2010; Farka, 2009). The literature comes to a general consensus that an increase in short-term interest rate is associated with a decline in stock returns. The event study approach by exploiting the very high frequency dataset address the problems of endogeneity and omitted variables bias by focusing on periods immediately surrounding changes

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Peer review under responsibility of Africagrowth Institute.

<http://dx.doi.org/10.1016/j.rdf.2014.07.002>

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in the monetary policy instrument. As an alternative to the event study approach Rigobon and Sack (2004) developed the heteroskedasticity-based estimation technique and found significant negative impact of monetary policy on the US stock indices.

The studies reviewed so far, has a predominant focus on developed countries especially in the case of US. In the context of developing economies, the empirical evidences are limited. See for instance Vithessonthi and Techarongrojwong (2012) who studied the response of stock returns to monetary policy in Thailand. Since the nature of financial markets and economic frameworks in developing countries differs from that of developed countries, the above findings may not be exactly relevant for developing economies. Accordingly, the first goal of the present study is to empirically investigate the impact of monetary policy on aggregate stock price index for the case of a developing country, Malaysia.

Moreover, the impact of monetary policy on stock prices is expected to be different across industries. Nowak (1993) argued that interest-sensitive industries and those that are relatively open to trade are likely to be more influenced by monetary policy. Ehrmann and Fratzscher (2004) also state that interest-sensitive, tradable goods industries and capital-intensive industries are expected to be more affected by monetary policy. Furthermore, some industries are cyclical and are highly sensitive to the state of the economy (Bodie et al., 2009). Monetary policy may have a stronger impact on stock returns of firms in cyclical industries than in non-cyclical industries. Therefore, the second goal of this study is to investigate the response of various sector-specific stock prices to monetary policy. This can serve as comparative analyses at the disaggregated levels.

This paper investigate the impact of monetary policy on aggregated and disaggregated stock price indices by allowing for a possible long-run relation among the level variables and, if it is present, examine whether the adjustment of the stock prices to the long-run path is symmetric or asymmetric using the asymmetric cointegration tests. Evidence of asymmetries in the link between the two variables has been established in the literature. More specifically, it has been evidenced that tight monetary policies appear to retard stock prices by more than easy monetary policies stimulate it (Bernanke and Kuttner, 2005; Chulia et al., 2010; Lobo, 2000). The response of stock prices to monetary policy shocks may also depends on the on the state of the business cycle (Andersen et al., 2007; Basistha and Kurov, 2008; Guo, 2004) or on the state of the stock market itself as indicated by bull and bear markets (Chen, 2007; Jansen and Tsai, 2010; Kurov, 2010; Perez-Quiros and Timmermann, 2000). In order to account for these characteristics the asymmetric cointegration framework developed by Enders and Granger (1998) and Enders and Siklos (2001) is employed. The empirical results of this study indicate that the aggregate stock price index, industrial stock price index and properties stock price index are noted to be asymmetrically cointegrated with monetary policy indicator with the faster adjustment of stock prices when they are below their long-run values. In other words, the stock prices tend to rise faster in the face of increases in short-term interest rate (contractionary monetary policy) than decreases in short-term interest rate (expansionary monetary policy).

The rest of the paper is structured as follows. In the next section, the methodology and data description and sources are provided. Section 3 discusses the estimation results. Finally, Section 4 concludes with the main findings and their implications.

## 2. Methodology and data

### 2.1. Methodology

In order to test if there is long run relationship between monetary policy and stock prices in Malaysia, first, the non-stationary or integration properties of the time series are examined using the widely used augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) unit root tests. Second, if the variables are non-stationary and integrated of the same order, the long-run relations are examined using the residual-based test by Engle and Granger (1987) and the VAR-based test by Johansen (1988) and Johansen and Juselius (1990), respectively referred to as the EG and JJ tests. These tests are sometimes not reliable because they do not account for asymmetric adjustments to the long run and their power is notoriously low in the presence of asymmetric adjustments. Thus, we also apply the asymmetric cointegration tests developed by Enders and Granger (1998) and Enders and Siklos (2001) as an alternative to the Engle and Granger (1987), referred to as the ES test. This test is based on the following specification of the residuals:

$$\Delta u_t = \rho_1 I_t u_{t-1} + \rho_2 (1 - I_t) u_{t-1} + \sum_{i=1}^k \mu_i \Delta u_{t-i} + e_t \quad (1)$$

where  $u_t$  is the error term obtained from the long-run relation between stock prices and monetary policy indicator.  $I_t$  is the Heaviside indicator function and  $k$  is the optimal lag order to make the disturbance term in Eq. (1) serially uncorrelated. The Heaviside indicator function can be specified to depend on the level of the error terms, called the threshold autoregressive (TAR) model, such that  $I_t$  can be written as:

$$I_t = \begin{cases} 1 & \text{if } u_{t-1} \geq 0 \\ 0 & \text{if } u_{t-1} < 0 \end{cases} \quad (2)$$

As an alternative specification,  $I_t$  is called the momentum TAR (M-TAR) and specified to depend on the changes of the error terms such that:

$$I_t = \begin{cases} 1 & \text{if } \Delta u_{t-1} \geq 0 \\ 0 & \text{if } \Delta u_{t-1} < 0 \end{cases} \quad (3)$$

Based on both TAR and M-TAR models, the necessary condition for cointegration is that  $2 < (\rho_1, \rho_2) < 0$ . The null hypothesis of no cointegration based on ES test ( $H_0 : \rho_1 = \rho_2 = 0$ ) can be tested using the  $F$ -statistics. Since the  $F$ -statistics has a non-standard distribution, we need to refer to the critical values as tabulated in Enders and Siklos (2001). In the presence of cointegration, the null hypothesis of asymmetric cointegration ( $H_0 : \rho_1 = \rho_2$ ) can be tested using the standard  $F$ -statistics. Rejecting the null provide evidences for the presence of the asymmetric adjustment process toward the long-run.

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