Is price level targeting really a free lunch:

Is Price-Level Targeting Really A “ Free Lunch”? This paper will provide a critical review of Lars E. O. Seventeen’s 1999 paper “ Price- Level Targeting versus Inflation Targeting: A Free Lunch? ” This paper will be set out in five sections. The first section will provide a brief understanding of the topic being discussed and the paper being reviewed will be place in context with regard to the debate surrounding the topic. The second section will provide a highlight of the literature, while the third section will contain a discussion of the model.

In the fourth section the model will be evaluated and in the last section I will place the findings of this paper in overall context. S venison (1999) notes that “ Price Stability’ is often a desirable goal for monetary policy. However, there is no precise definition of price stability. Taken literally, price stability can be interpreted as keeping a stationary price level with low variance (City, 2002; Sevenths, 1999). In practice however, price stability has been interpreted as low and stable inflation (Sevenths, 1999).

There are two main monetary policy regimes used to achieving price stability; Inflation Targeting and Price-level targeting. Inflation targeting is the most commonly used monetary policy. It was first used in practice in New Zealand in 1990 and has been very successful in stabilizing both inflation and the economy (Sevenths, 2007). As of 2007 it has been implemented by more than 20 countries (Sevenths, 2007). Inflation targeting is characterized by an announced numerical inflation target that the central bank must stabilize around by using policy instruments, such as interest rates.

Inflation targeting can result in base drift of the price level if above average inflation is not followed by below average inflation. Base drift in the price level is when the price level is no longer non-trend stationary, and the variance of the price level in the future is allowed to increases for the whole forecast horizon without being bound (Sevenths, 1999). This is quite far from the literal translation of price stability. In Sevenths (1999) he interprets inflation targeting as implying not only a method to stabilize inflation around an inflation target, but in practice, also to stabilize output (or the output gap).

Price-level targeting is the most direct way of price stability as it targets the general price level ether than targeting an inflation rate (City, 2002). It works by the central bank announcing a constant or slowly increasing price level target. With price-level targeting, if the price level experiences a positive shock in this period, the central bank must respond by lowing the price level in the next period to offset that shock (Gender, 2006). This is the main stumbling block of price-level targeting, as conventional wisdom suggests, this would lead to both high frequency inflation and output variability.

This conventional wisdom is one of the reasons why Sweden, teen 1931-37, is the only country to have used price-level targeting (City, 2002). Sevenths (1999) argues against this conventional wisdom and has found that price-level targeting dominates inflation targeting in the sense it results in a better output- inflation variability trade-off, when a Lucas-type Phillips curve that allows for persistence in output is used (Gender, 2006). Sevenths also found that price-level targeting Is also perpetrated even when collects NAS Notation targeting preferences.

However, because price-level targeting has only been used once, data on this is very care. Therefore, all research on price-level targeting has been theoretical or involved simulations (City, 2002; Sevenths, 1999). Because of this, we cannot conclude on what is the better policy. However, we do know that inflation targeting is the most common form of price stability today, and has been successfully used to stabilize both inflation and the real economy for the last 20 years (Sevenths, 2007).

Since Seventeen's paper, the debate of price-level targeting vs.. Inflation targeting has increased. If Sevenths is correct, and under situations of output persistence price- bevel targeting does result in a better output-inflation variability trade-off, then this would be the largest monetary policy change since inflation targeting was introduced in New Zealand in 1990. It would also reverse centuries of conventional wisdom and intuition on the effects of price-level targeting on output variability and inflation.

It is also important as a price-level targeting policy regime reduces the long term variability of the price level. This would be beneficial to international decisions and long term nominal contracts, as price level forecasts into the future would be significantly easier, or not needed at all, if the central bank had significant credibility (Sevenths, 1999). Literature Review: The topic under discussion is described in a large amount of literature, with many authors testing new and modifying old models of price-level targeting.

In Killed (1998), Killed objects to the use of a Neoclassical Phillips Curve used by Sevenths (1999), and instead questions if a New Keynesian Phillips Curve was used instead, would Sevenths have found such encouraging results in

favor of price-level targeting (Dimmitt, Gavin, & Jutland, 1999). Dimmitt and Gavin (2000) have shown that this s not true, and that a New Keynesian Phillips Curve actually shows more evidences in favor for price-level targeting than a Neoclassical Phillips Curve (Dimmitt et al. 1999). Dimmitt and Gavin (2000) also found that a price-level targeting regime will also provide a more favorable output/inflation trade-off, even when the current level of output does not rely on last period’s output. Vesting (2000) found that price-level targeting produces better results than inflation targeting in a standard New- Keynesian model with forward-looking expectations, when the central bank has to pirate in an environment characterized by discretion.

Sevenths (1999) also found a similar result when the central bank acts under discretion however, this result was found using a Lucas type Phillips Curve and requires some output gap persistence. Manikins (2000) is more in the favor of inflation targeting and believes that inflation targeting should stay as the regime of chose for achieving price stability. Manikins questions the results of those in favor of price-level targeting as they are dependent on key assumptions about the price-setting process and whether they are forward or awkward looking.

He also suggest that price-level targeting may lead to more frequent periods of deflation that which will result in lower interest rates on average and overall financial instability. One of the only papers using simulations was performed by Mclean and Prior (2000). They found that the assumptions made about expectations were crucial in determining the result from adding price-level targeting into a reaction function that follows a Taylor rule.

The authors found that when agents are highly backwards-looking, there is a trade-off between slightly decreased Notation variedly y Ana slantingly Increased output Ana Interest rate variability. They went on to explain that if expectations are highly model-consistent, then the introduction of a price level target may reduce inflation and output variability, without significantly changing the variability of nominal interest rates. The Model: Sevenths (1999) comprises four sections where the author compares price-level and inflation targeting under moderate persistence in output.

In section one the author presents the model with an inflation-targeting central bank, while section two introduces a price-level targeting central bank. Section three discusses the less realistic case when there is a commitment mechanism by which the central bank can commit to the optimal rule, and section four evaluates having a price-level targeting central bank in the case when society has preferences corresponding to inflation targeting.

Section One: Inflation Targeting Sevenths (1999) begins with a short-run Phillips Curve that is the same as the one used in Lucas (1973), where it is motivated by imperfect information about the general price level (p. Yet= pity-l+ Exit-TTT-1+ Et Where Yet is the (log) output gap in period t, and p are constants TTt= opt – opt-l is the (log of the gross) inflation rate, opt is the (log) price level, TTT-1 denotes inflation expectations in period t-1 of the inflation rate in period t, and Et is an lid. Temporary supply shock with mean zero and variance 02.

The private sector has rational expectations; that is, TTT-1= Et-TTT (2) Where Et-l denotes expectations conditional upon information available in period t-1, which includes the realization of all the variables up to and including period t-1, as well as the constant parameters of the model. Thus (1) and (2) represent the constraints facing the central bank. In Seventeen's model inflation targeting is not only interpreted as stabilizing inflation around a given (long-run) inflation target, IT*, but as stabilizing the output gap around an output gap target, y* as well.

This can be represented by an international loss function for the central bank given by 2+Ext-y*2 (3) With the period loss function (4) is the relative weight on output-gap stabilization. The output-gap target y* is taken to be nonnegative, . Sevenths assumes for simplicity that the central bank has perfect control over the inflation rate lit, and the timing is such that the inflation rate in each period is set after observing the current supply shock Et.

What allows monetary policy to be effective in Seventeen's model, even though the current supply shock is observed by the central bank and the private sector, are the assumptions behind the Phillips curve (1) that some prices or wages are set in advance and predetermined by previous expectations. The decision problem of the central bank can be written Wit- 1 = mint 12th-TO* 2+ɥV(Yet) (5) Where the minimization in period t is done for given inflation expectations TTT-1, and is subject to (1).

Therefore, the central bank takes into account that changes in the current output gap will affect rent expectations of future inflation, but it no longer

internalizes the effect of its decisions on inflation expectations. (6) The decision rule and the output gap are (7) Yet= pity- 1 +(1 -ABA)?¬t (B) I Norte, Notation can De written as a linear Tunnel AT ten current output-gap, with a negative coefficient (7), or as a function of the lagged output-gap and the current supply shock (8). Sevenths (1999) summarizes his result under discretion in a table.

The author finds that the output-gap follows an AR (1) process (row 1), and that an average inflation bias occurs, , (row 4). The average inflation bias will be positive if the output-gap is positive. However, if the output-gap target is zero, y*= y= O, then there is no average inflation bias. Sevenths also finds that the unconditional variance of the output-gap is proportional to the unconditional variance of inflation (row 5), and that the variance of the price level is infinite (row 7) due to the fact that the price-level is an ‘(1) process (row 6).

Section Two: Price-Level targeting Sevenths (1999) rewrites his Phillips Curve (1) into the form (p. 283-5) pity-l+ accept- opt-l+ Et (9) as opt-opt-1= TTt-TTT-1, where opt-l the expectations in period t-1 of the (log) price level in period t. The private sector has rational expectations, implying that (10) The central bank has the period loss function opt-1= Et-opt (11) opt* is the (log) price-level target. The price-level target is (12) Because Sevenths assumed that the central bank has perfect control over inflation, it must also mean that they have perfect control over the price level.

The central bank observes the supply shock Et, and then sets the price-level in each period. The central banks decision problem under discretion is Wit-

1= Et-1 input opt- (13) Equation (13) takes the price-level expectations, opt-l as given, but also acknowledges that changes in the current output-gap will affect price-level expectations opt+let. The minimization in period t is once again subject to (1). As can be clearly seen, the decision problem is the same as under inflation targeting, except for the change in variables from Tit to opt. Therefore, the indirect loss function is also the same.

The price level is the same as (7), except that Tit is now opt, and the output-gap is the same as (8). opt= a-bal-abet= a-bal-abaft-l- bet (14) Therefore, the price-level and inflation act in the same manner, except that we now have an average price-level bias instead of an inflation bias. The price-level will be rend stationary, with finite unconditional variance. Inflation (row 3) is given by Tit = opt-opt-l -ABA(Yet-Yet-l) (15) Therefore, when inflation is compared under inflation and price-level targeting, we can see that under inflation targeting, inflation is a linear function of the output gap.

However, under price-level targeting inflation is the same linear function of the first- difference of the output gap (row 3). Thus, the level of the unconditional variance of inflation under inflation and price-level targeting simply depend on the level of the unconditional variance of the level and first-difference of the output-gap. Sevenths found that if there is sufficient persistent in the output-gap, then the variability of its first-difference is less than the variability of its level.

He also showed that the unconditional variances AT ten level Ana T RSI -a Deterrence are related Vary[Yet-Yet-l (16) From equation (16), it can be seen that if p> 12, then the unconditional variance of the first-difference of the

output-gap is lower than the unconditional variance of the output-gap. Therefore, if there is moderate persistence then the unconditional variance of inflation is lower under price-level targeting. Section Three: Commitment Sevenths (1999) now assumes that there is a commitment mechanism, so that the central bank can commit to the optimal rule.

Under inflation targeting, the optimal rule (p. 285-7) The output-gap is Yet= pity-l+ I-CB* Et (17) where (18) (19) Therefore, under commitment, inflation does not depend on the lagged output-gap, it only depends on the new information that has arrived after the private sector formed its expectations. Under commitment, there is no inflation bias. Sevenths notes that any reliance on previous information known by the private sector would Just go into expected inflation, which would not affect the output-gap, and would Just add to the loss function.

Under commitment, the optimal rule under inflation and price-level targeting are the same, except that Tit and replace opt and p*. Therefore, the price level is (20) the output-gap is (19). Sevenths again records his results in a table. Inflation under price-level targeting is Thus, the unconditional variance of inflation is twice the variance under inflation targeting (row 3). Therefore, price-level targeting results in higher inflation variability when the central bank acts under commitment. This is because there is no resistance of inflation and the price-level under commitment.

Section Four: Price-level Targeting Even If Society Has Inflation Target preferences In tons Stetson, Sevenths (HEY) assumes Tanat ten central Dank NAS no commitment technology and acts under discretion, and society

can assign either the loss function (3) and (4), or the loss function (3) and (11). Using the evidence from previous sections, it is obvious that if social preferences correspond to price-level targeting, it is better for the central bank to using price-level targeting. Therefore, the real question is what if social preferences correspond to inflation targeting?

Sevenths (1999) suggests that if there is moderate output-gap persistence, then it would be beneficial for the central bank to once again apply price-level targeting. Sevenths states that this is because (I) it causes less inflation variability and (it) it results in the same output-gap behavior. Also, if there is a positive output-gap, then price-level targeting results in an additional benefit as it eliminates any average inflation bias. The optimal decision rule under commitment for inflation targeting is (17). Using (19), it can be written as (21) The decision rule for an inflation targeting central bank under discretion

TTt= a-be-x byte (22 Where and b> b*. The decision rule for a price-level targeting central bank under discretion (23) Sevenths suggests that with enough output-gap persistence, Yet-Yet-l (the first- difference of the output-gap) is a better approximation of Yet-pity-l (the unanticipated change in the output-gap) than Yet (the output-gap). The additional benefit of no average inflation bias also occurs under price-level targeting if the output-gap is positive. Sevenths suggests that this is enough evidence to suggest that price-level targeting is a more preferable regime for a central bank, even if society prefers inflation targeting.

Evaluating the Model: Because Seventeen's results are solely theoretical it has to be taken with a pinch of salt. Although this is not his fault, as price-level targeting has only been used once in history, it would be unwise to state that price-level targeting should be the regime of chose for central banks, solely based on Seventeen's research. Seventeen's findings also rely heavily on some key assumptions. In all four sections of Seventeen's model, the requirement of moderate output persistence has been the key to the success of price-level targeting over inflation targeting.

However, is output persistence a valid assumption, and is it something that a lot of countries experience? Sevenths suggests that persistence in output movements is the more realistic case. He backs up this claim by stating two instances in which output persistence could occur. These are; Trot sticky prices In ten P-Dare model Ana Owe to Imperfections In ten ladder market. In my opinion two instances are not enough to back up his claim, and more time should be spent explaining why persistence in output was the more realistic case.

However, Seventeen's assumption might not be necessary, as research from Cover and Peignoir (2005), which uses the same model as Sevenths but assumes that the output-gap is not persistent and the central banks policy choice must be chosen before knowing the current value of the supply shock, has found similar results to Sevenths (Watcher, 2011). The use of a Neoclassical Phillips Curve has also been widely criticized because of the fact that the social loss function (4) cannot be derived as an approximation to the expected utility loss of the representative household (Watcher, 2011).

Therefore, welfare analyses based on the Neoclassical Phillips curve is not micro-founded Watcher, 2011). From an empirical perspective, the Neoclassical Phillips curve has also been criticized as it implies that only unanticipated inflation influences output, which contradicts evidence from structure VARY literature (Watcher, 2011). Instead of using a Neoclassical Phillips Curve, Sevenths could of used a New Keynesian Phillips Curve which has been shown to provide better results, and allows for micro-founded welfare analysis (Watcher, 2011).

Vesting (2000) compares price-level and inflation targeting with a New Keynesian Phillips Curve, where the central bank acts under discretion. Vesting's findings have been similar to that found by Sevenths, showing that Seventeen's free lunch result is robust to a change in Phillips Curve (Watcher, 2001). This is a positive result for price-level targeting as it shows that it can hold-up under different specification. In Seventeen's model he uses backward-looking expectations. However, was this the right choice, or should he of used forward-looking expectations?

Many econometric model simulations with backward-looking expectation have found that price-level targeting results in higher short-run variability for both inflation and output growth Dimmitt & Gavin, 2000). However, the models with forward-looking expectations favor much better in reducing inflation and output variability, although when fixed adaptive expectations are assumed, it turns out that forward-looking expectations are the worst (Dimmitt & Gavin, 2000). Therefore, assumptions about expectations are a crucial part of the model and must be decided on carefully, as they have a large impact on the results of the model.

The inclusion of section four, where Sevenths compare price-level and inflation targeting where society prefers inflation targeting, was a wise choice by Sevenths as his section best represents today's climate. Therefore, the result of price-level targeting outperforming inflation targeting is quite significant. The results of Seventeen's model are very difficult to follow due to the fact that they are represented as a table full of equations with very little explanation of what they mean. This meaner that the reader has to spend a lot of time deciphering the implications of these equations, and then form his/hers own opinion.

Now some would argue Tanat tons Is a good tong, out In my pollen Sevenths snouts nave spent more time explaining the equations he used, and why he used them, as well as roving a better explanation of the equations in his results tables. The possible result of negative interest rates brought on by periods of deflation resulting from price-level targeting, as suggested by (Manikins, 2000), was never anticipated by Sevenths. Negative interest rates is an important thing to be wary of, as some economists argue that monetary policy is ineffective when we have negative interest rates (City, 2002).

Therefore, if price-level targeting results in negative interest rates, then price-level targeting would be a worse regime than inflation targeting, and Seventeen's results would be wrong. Overall Context: The lack of real world data is still the main hold-up of price-level targeting. Many papers like Seventeen's provide evidence of price-level targeting outperforming inflation targeting, but the models being used contain to many assumptions and lack evidence form econometric simulations. Because of this, the conventional

wisdom about price-level targeting still stands and no central bank has been brave or stupid enough to take the risk.

Most of the current research on this topic is now following a New Keynesian approach, suggesting that the Neoclassical approach used by Sevenths is out-dated or inferior to the New Keynesian models. The fact that Seventeen’s paper was published over 10 years ago, but no central bank has been willing to try price-level targeting shows that his research, and the research of others has not been concrete enough to turn the tide in price-level targeting favor. However, if price-level targeting was successful, then the gains from it would surpass that of Just having a better output/inflation trade-off.

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