A Banach algebra $A$ with a Banach subalgebra $B$ and an element $b \in B$ such that $sp(A, b)$ is a proper subset of $sp(B, b)$.

Consider $A(\Delta)^1$ and the isometric isomorphism $f \mapsto f|_T$, from $A(\Delta)$ onto the closed subalgebra $B$ of $A = C(T)$ generated by 1 and inclusion $z : T \to \mathbb{C}$ ($T$ is the unit circle). Then $sp(B, z) = sp(A(\Delta), z) = \Delta$ and $sp(A, z) = T$.

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1Let $\Delta$ denote the closed unit disc $\{ z \in \mathbb{C}, |z| \leq 1 \}$. Suppose that $A(\Delta)$ denoted the set of all elements of $C(\Delta)$ which are analytic on the interior of $\Delta$. $A(\Delta)$ is a closed subalgebra of $C(\Delta)$. 

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